the OIL AND GAS JOURNAL

OCTOBER 15, 1956

TRUCE CLEARS WAY FOR DRILLING OFF LOUISIANA

. . . But the dispute has dampened the enthusiasm of operators in the gulf

p. 84

Also:

› Gas Imports From Mexico Approved
p. 92

› New Nuclear Radiation Logging Method
p. 109

› Determine Hydrogen Content in a Hurry
p. 133

› Cardium Concept Due for Overhauling
p. 185

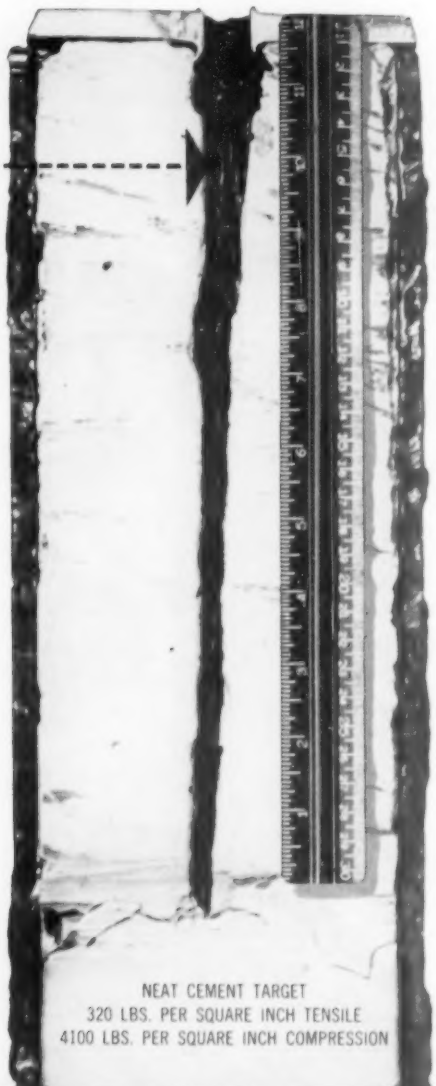
Complete table of contents and article digests on pages 2 - 3

All you see is the "keyhole"

⅛" HOLE IN FLUID SEAL
⅝" HOLE IN STEEL PLATE

1" DIAMETER HOLE
IN TARGET

but look at the "hallway" it blasts!



NEAT CEMENT TARGET
320 LBS. PER SQUARE INCH TENSILE
4100 LBS. PER SQUARE INCH COMPRESSION

with

"Karrotfree" Koneshot

Just as the size of a room has no relation to that of the keyhole in its door, you can't judge the depth or diameter of a "KARROTFREE" Koneshot perforation by the tiny hole you see in the screw port when the gun comes out of the hole.

The photograph on the right shows what you really get with Lane-Wells exclusive "KARROTFREE" Koneshot Perforating. The screw port shown is the actual one which protected the "POWER-PAK" shaped charge which punched that hole through ⅜" steel plate and nearly 12" into 16-day neat cement. "KARROTFREE" Koneshot was *planned* to do just that – to punch a tiny hole in the screw port, thus trapping formation-plugging carrot and charge debris, and drive deep into the formation for maximum penetration and optimum production. And only the Lane-Wells exclusive "POWER-PAK" shaped charges used in "KARROTFREE" Koneshot can give you this combination of deep penetration and debris-free hole!

Tomorrow's Tools – Today!

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Mail Address: P.O. Box 1664, Houston 1, Texas

General Offices, Export Office and Plant
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LANE-WELLS CANADIAN CO. IN CANADA
PETRO-TECH SERVICE CO. IN VENEZUELA

A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

Word from Venezuela is that the government is holding up a decision to offer new Barinas concessions until the Suez situation jells.

The theory is that if Suez should be closed, Western Hemisphere oil would become more attractive and Barinas acreage would draw higher bids. Hot competition there is already assured. The Socony-Sinclair discovery indicates a big potential area, a pipeline outlet is due soon, and companies who lost out in Lake Maracaibo will be bidding against those who have already applied for Barinas rights.

Hydraulic motors are due for a big play in natural-gasoline and other field-processing operations.

These units which utilize energy from pressure drop in fluid streams are efficient, comparatively low in cost, and have no direct operating cost other than maintenance. They are installed at points where stream pressure must be reduced anyway because of processing requirements.

Biggest use so far is to drive pumps in natural-gasoline plants. Here the units are used to pump rich-oil streams, lean-oil streams, and column-reflux streams.

Automatic-logging and electronic-computing systems are expected to move rapidly into refining and petrochemical plants.

Processors are eying present applications expectantly and may be expected to act fast when the systems prove themselves in commercial operations.

The trend is to utilize computers directly in control systems when possible. Present practice requires manual interpretation of control data and manual programming of the calculators.

Gas analysis by chromatography seems to be one of the most promising developments in the gas-processing industry in years.

The method, which uses a simple selective-adsorption principle, promises to cut gas-analysis time from hours to minutes. As the units are developed, it appears that cost will be cut to a fraction of that of conventional units.

The method may be applicable also to direct monitoring and control of gas streams. Not only would such a unit provide a fast analysis, but it would also automatically change various process conditions to insure best over-all operation of the process.

An "automatic office" will soon be installed in a Middle West refinery. Latest developments in electronic computation will be used in operation of a petrochemical unit.

Data from the plant, reduced to digits, will be transmitted by wire to the refinery office, where it will be analyzed in one of the largest computers yet installed. This information, compiled in a few minutes, will be returned by wire to the control room of the petrochem unit for guidance of operators.

Next big step in this field, it is predicted, will be automatic control of the petrochem operation based on computer information.

Some operators are going to get additional oil from leases already watered out by water-flooding operations.

A new technique is to follow the water flood with a gas—either air, nitrogen, or natural gas. Just how much more oil will result depends a lot on reservoir factors, but an additional 10 per cent of the pore space appears possible.

the OIL AND GAS JOURNAL

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IN THE NEWS

Pipelines:

Pipeline Hopes for Fair Field Price Killed by Court — 87
Texas Eastern's Plan to Import Mexican Gas Approved — 92
Pipeline Briefs — 92
FPC Sets Precedent for Softer Attitude in Gas Sales — 94
Dutton-Williams Brothers Is Strapping Infant in Canada — 95
Rangeland Renews Bid for Alberta Crude Line — 99
Speed Record Set in Laying Underwater Pipeline — 100
Northern Natural Gas System Expanding in South Dakota — 101
I.P.C. Takes Offensive in Pipeline Fuss With Lebanon — 104

Processing:

Pint-Sized Platformer Upgrades Natural Gasoline — 86
O.C.A.W. Sets "Substantial" Wage Hike as Goal for '57 — 94
Distillation Train Reshaping Profile of Styrene Plant — 96
Processing Briefs — 99
Gas Products Plant on Stream in Texas' Hulldale Field — 101
Southland Pushes Tennessee, Florida Refinery Buildup — 102
Agreement Near on Airline Jet-Fuel Specs — 103

General Interest:

Imports, Prices Cut Drilling, I.P.A.A. Head Claims — 91
Colorado's Oil-in-Place Allowable Voided Without Test — 95
Oil's Vast Radio Net Eyed as Possible Emergency System — 96
British Petroleum Again Stymies Trinidad Sale — 105

Drilling:

Truce to Revive Offshore Operations, Future Clouded — 84
Turbodrill to Hit U. S. Market by Late Next Year — 90
Water Delays Completion of Costa Rican Strike — 106

Exploration:

California's Mountain View Field Gets New Deep Pool — 102
Kuwait May Offer Offshore Concessions Soon — 106
Gilliland Spuds Wildcat on Coast of Turkey — 106
New Idea in Seismic-Magnetic Data Processing — 127
Cardium Concept Due for Overhauling — 185

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

. . . an integrated magazine serving an integrated industry

TECHNOLOGY—OPERATION

Exploration

Seismic-Magnetic Data Processing **127**
By R. C. Dunlap, Jr.
Here's a new concept, now being developed intensively on a broad basis. Seismic-magnetic data processing should prove a boon in helping geologists to interpret the geophysicist's language.

Pipelining

Sampling Particulate Matter in High-Pressure Gas Streams **120**
By R. L. Solnick
The determination of particulate-matter concentration and size distribution in high-pressure-gas pipelines may be accomplished with this new equipment designed on well-established principles.

Pipeline Patrol—Construction Tables **155**

Drilling-Production

The Multispaced Neutron Log **109**
By Gilbert Swift and Russell G. Norelius
These logs have been valuable in Venezuela in distinguishing between gas and oil zones. With proper interpretation, this is only one of several potential applications of this tool.

Liquid Cyclone Cuts Cost of Treating Drilling Fluids **114**
By W. E. Bergman, C. J. Engle, S. J. Marwil and E. W. Porter
Pit jetting for removal of sand and other drilled solids which accumulate in drilling muds leads to high mud costs. Use of a 3-in. diameter liquid cyclone on the mud stream can almost completely overcome this problem.

Plastic Pipe in the Oil Fields **117**
Plastic pipe is now well established in the oil fields. It is used primarily to handle sour crude oil and salt water. It is easily handled and rapidly laid. Paraffin buildup is minimized.

Oklahoma Deep Test Goes to 14,376 Ft. **126**
By Everett A. Skarda
By careful attention to drilling, techniques, Frankfort Oil Co. drilled the 2 Hale in Oklahoma's Arbuckle Mountains with a minimum of trouble.

On The Job . . . In The Fields **136**
Finding the torque load on the gear teeth of pumping units running on electric power is relatively simple with a new method devised by Continental Supply Co.

Refining-Processing

Determine Hydrogen Content in a Hurry **133**
By Frank J. Piehl
Strontium-90 is an excellent source of beta rays for determining the hydrogen content of liquid hydrocarbons. The analysis technique, developed in the laboratory, is beginning to find plant application.

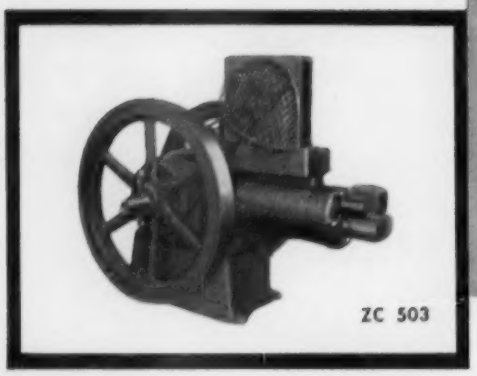
Cathodic Protection at Cities Service Refinery **138**
By G. H. Hill
The cathodic-protection systems at Cities Service Refining Corp.'s Lake Charles refinery consist of one system for the lead-sheath power and control cables, and another for the underground piping and storage tanks. The systems have worked well over a 2-year period.

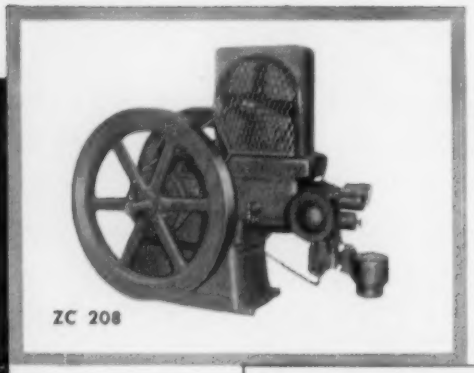
On The Job . . . In The Plants **132, 134**
Phillips trains operators to fight fires—air-tight cabinet protects flash-point apparatus—equipment life is lengthened with simple changes.

Cost-imating **147**
Equipment Design and Operation **148**
The Foreman's Page **149**

DEPARTMENTS

A Glance Ahead	1	On the Job . . . In the Fields	136	Personals	213
They Say	68	Cost-imating	147	Deaths in the Industry	215
Calendar of Events	75	Equipment Design and Operation	148	Statistical Summary	216
Journally Speaking	79	Foreman's Page	149	Drilling Statistics	217
Editorial	81	Drilling Contractors	151	Supply Statistics	218
This Week	83	Pipeline Patrol	155	Refining Statistics	219
Watching Washington	89	Equipment Digest	164	Markets	220
International News	104	Equipment Men in News	182-226	Classified Advertising	221
On the Job . . . In the Plants	132-134	Exploration Highlights	185	Advertisers' Index	227


ZC 503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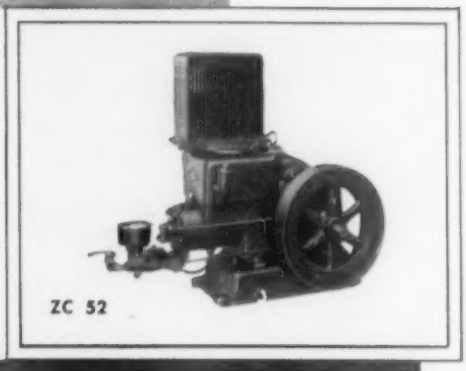
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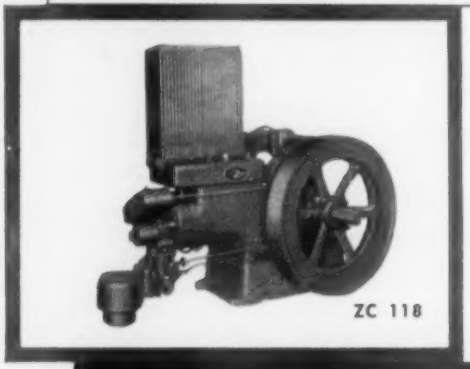
pick a "ZC" that best fits your pumping unit!

The broad Fairbanks-Morse "ZC" line has an engine that will best fit your pumping unit . . . from 3 to 30 hp. They're economical and easy to maintain—simply designed with no complicated parts or delicate adjustments.

All "ZC" sizes are high displacement, heavy-duty, slow-speed models—ideal for oil field pumping service! And, all sizes have the famous extra-heavy double flywheel for symmetry and perfect balance . . . with power take-off on either side of the engine.

See your local supply store about the "ZC" line . . . or write Fairbanks, Morse & Co., Chicago 5, Illinois.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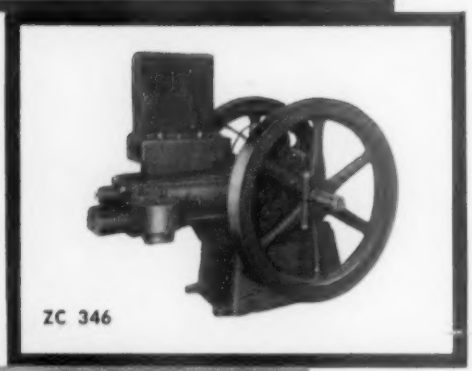
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a name worth remembering when you want the best

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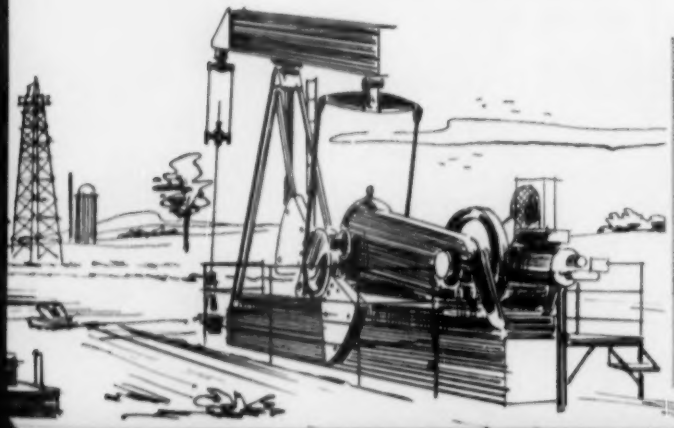
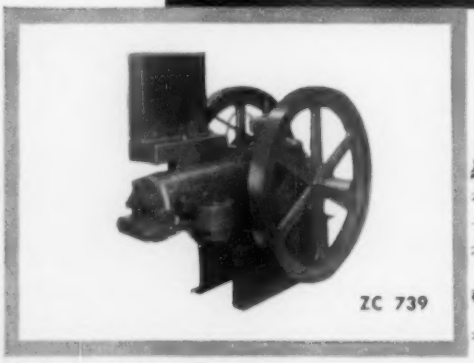
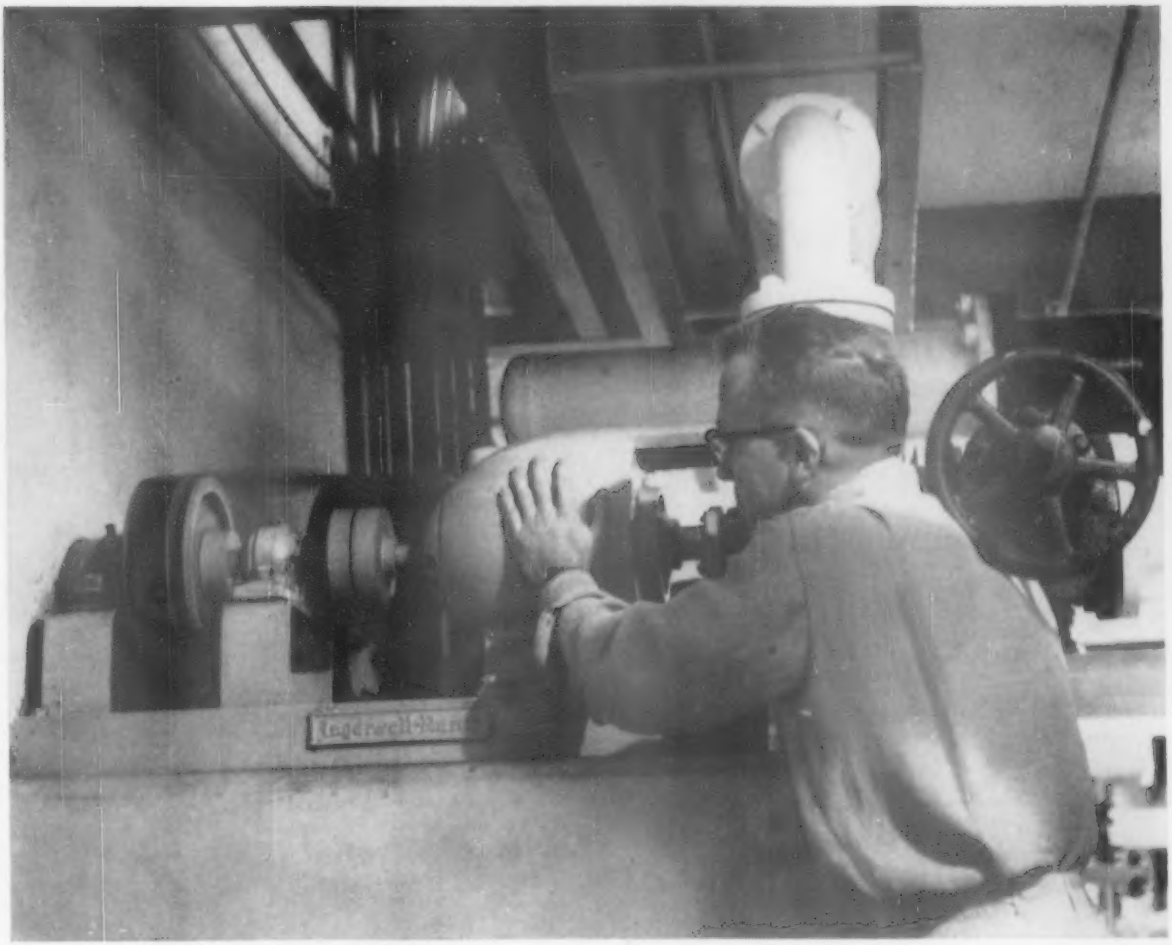



ZC 739

B.F.Goodrich



2 years–792 million gallons pumped with B. F. Goodrich V belts

THAT set of B. F. Goodrich high-capacity V belts has been in constant use for 2 years driving a water pump and oil pump in a natural gas pumping station. During this time more than 792 million gallons of cooling water and oil have been pumped without a single shutdown because of belt trouble.

Reliable, efficient belt performance is a must in pumping stations. Here is what the manager of the pumping station shown here has to say about the performance of this set of belts, "After 2 years of dependable service with B. F. Goodrich V belts we sure will never take a chance on any other belt."

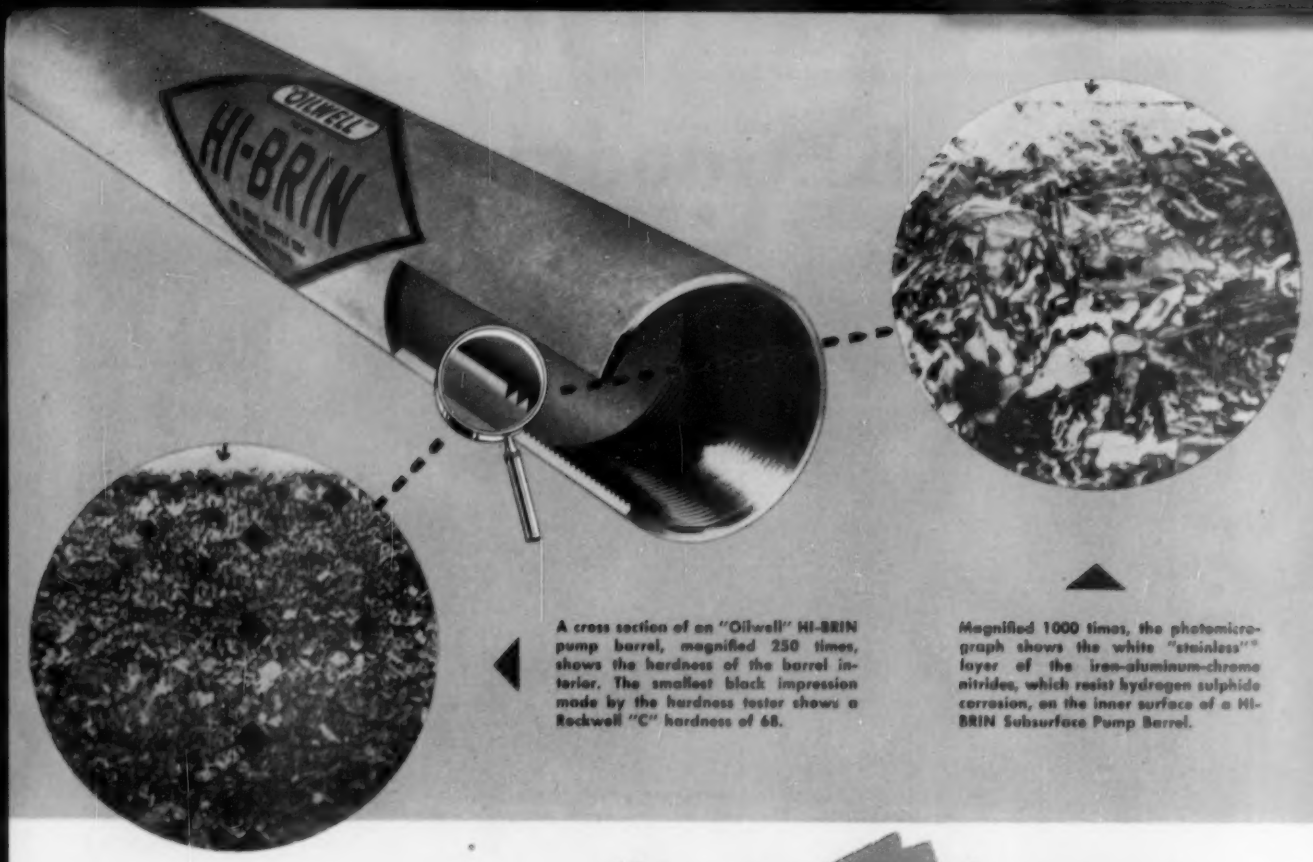
Grommet construction is the reason B. F. Goodrich high-capacity V belts outlast and outperform other types of premium belts. Only with grommet construction is it possible to *increase* the number of cords reinforcing a V belt and still retain flexibility and resilience. Grommets are two extra strong cord loops inside the belt, like twisted cords except that they're endless. The B. F. Goodrich high-capacity V belt carries a 40% higher horsepower rating because it's built with larger grommets, having 40% more tensile strength.

Today's B. F. Goodrich V belts are the result of constant improvement, better processes for prestretching cords, for improving cord adhesion, for reducing internal heat and friction. You'll find B. F. Goodrich V belts at leading supply stores in the oil field, or at any one of these B. F. Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Hobbs, Oklahoma City, Tulsa, Dallas, Houston, Odessa, Wichita Falls. *B. F. Goodrich Industrial Products Company, Dept. M-775, Akron 18, Ohio.*

Grommet—T. M. The B. F. Goodrich Co.

B.F.Goodrich

INDUSTRIAL PRODUCTS



A cross section of an "Oilwell" HI-BRIN pump barrel, magnified 250 times, shows the hardness of the barrel interior. The smallest black impression made by the hardness tester shows a Rockwell "C" hardness of 68.

Magnified 1000 times, the photomicrograph shows the white "stainless"* layer of the iron-aluminum-chrome nitrides, which resist hydrogen sulphide corrosion, on the inner surface of a HI-BRIN Subsurface Pump Barrel.

You can *see* the reason why "Oilwell" Hi-Brin Subsurface Pump Barrels *are so outstanding in their class!*

You do not need the trained eye of the metallurgist to see, in these photomicrographs, why Hi-Brin Barrels have superior resistance to hydrogen sulphide corrosion and abrasive wear.

The white "stainless"* layer in the upper right-hand picture is composed of superhard nitrides which are extremely resistant to hydrogen sulphide corrosion. When produced by "Oilwell's" exclusive (patented) Nitrocycle process, these nitrides penetrate deeper and attain an homogeneous surface that is free from the brittleness peculiar to conventional nitriding processes.

The black, diamond-shaped test impressions in the lower left-hand picture show the uniform inside hardness which makes Hi-Brin Barrels so resistant to abrasive wear. Distortions, associated with conventional surface-hardening methods, are avoided with the controlled Nitrocycle process. As a result, these barrels can be advance finish-honed, with only a light polishing operation after the surface is hardened, removing only 1/10,000 of an inch and leaving all the desirable hardened surface to serve in your well. Bore size and straightness are controlled by precision air-gauging.

**Experience shows excellent resistance to the acid sulphide corrosion found in wells, just as it resists the acid used for etching the micro specimen.*

But pictures alone can't give you ALL the facts about these HI-BRIN Barrels!

STRENGTH . . . is provided by the 3½% nickel steel tube that has its own outside heat treatment for maximum toughness.

ECONOMY . . . results from one-piece barrel construction, even up to the 30-foot lengths.

Contact your "Oilwell" representative or your "Oilwell" store for a HI-BRIN Subsurface Pump. Test it in a hydrogen sulphide well, even under severe abrasion conditions. One HI-BRIN pump always leads to more.

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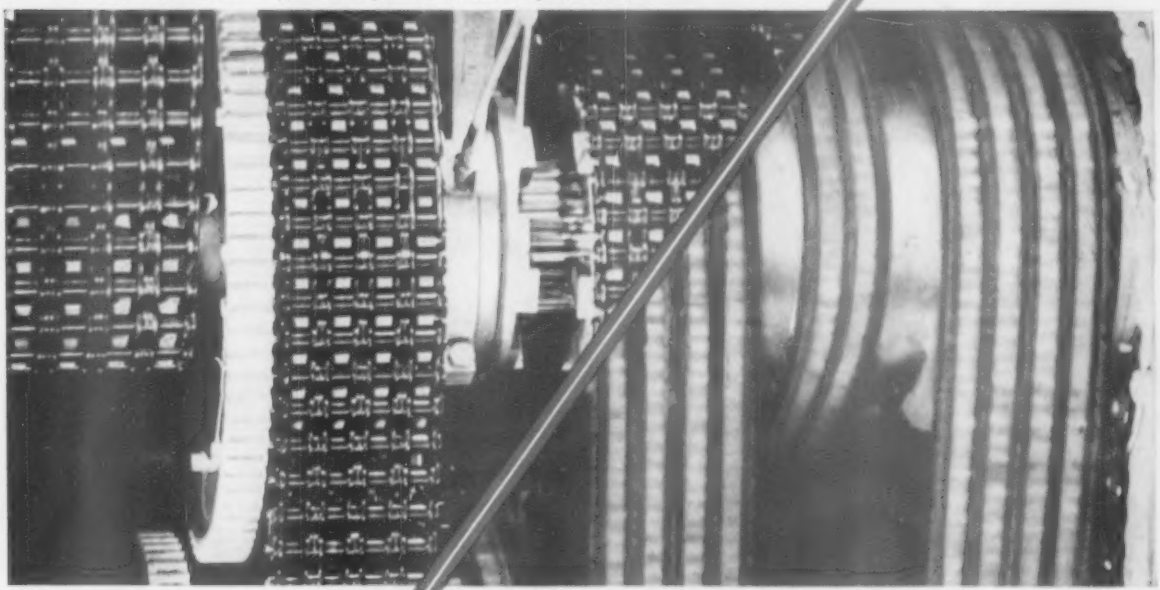
Not just static strength, but . . .

RESISTANCE TO TENSILE STRESS is achieved by use of properly heat-treated, accurately-machined sidebars made of premium steel and fitted with properly-hardened pins, bushings and rollers. But to resist *operational* stresses, additional controls over dimensional accuracy, uniformity and roller resiliency are essential.



STRENGTH OF CHAIN IN MOTION is accomplished through tensile strength *plus* special Link-Belt refinements. These include pitch-hole preparation, micro-finish of parts, special processing of sidebars, prelubrication and rigid quality control from initial selection of materials to final protective boxing. Here dynamic strength assures top efficiency on this Brewster N-12 drawworks transmission.

dynamic strength

assures longer work-life for LINK-BELT Roller Chain

INCREASED stresses of today's longer drill collar strings, greater hook loads and higher horsepowers and speeds require endurance never before demanded of roller chain. Link-Belt's solution: greater dynamic strength, achieved through design, manufacturing and processing "extras" . . . plus a combination of other important refinements. And you get results in more efficient performance that lasts measurably beyond the life of ordinary roller chain—cut downtime and drilling costs.

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LINK-BELT gives you dynamic strength that comes from these important EXTRAS

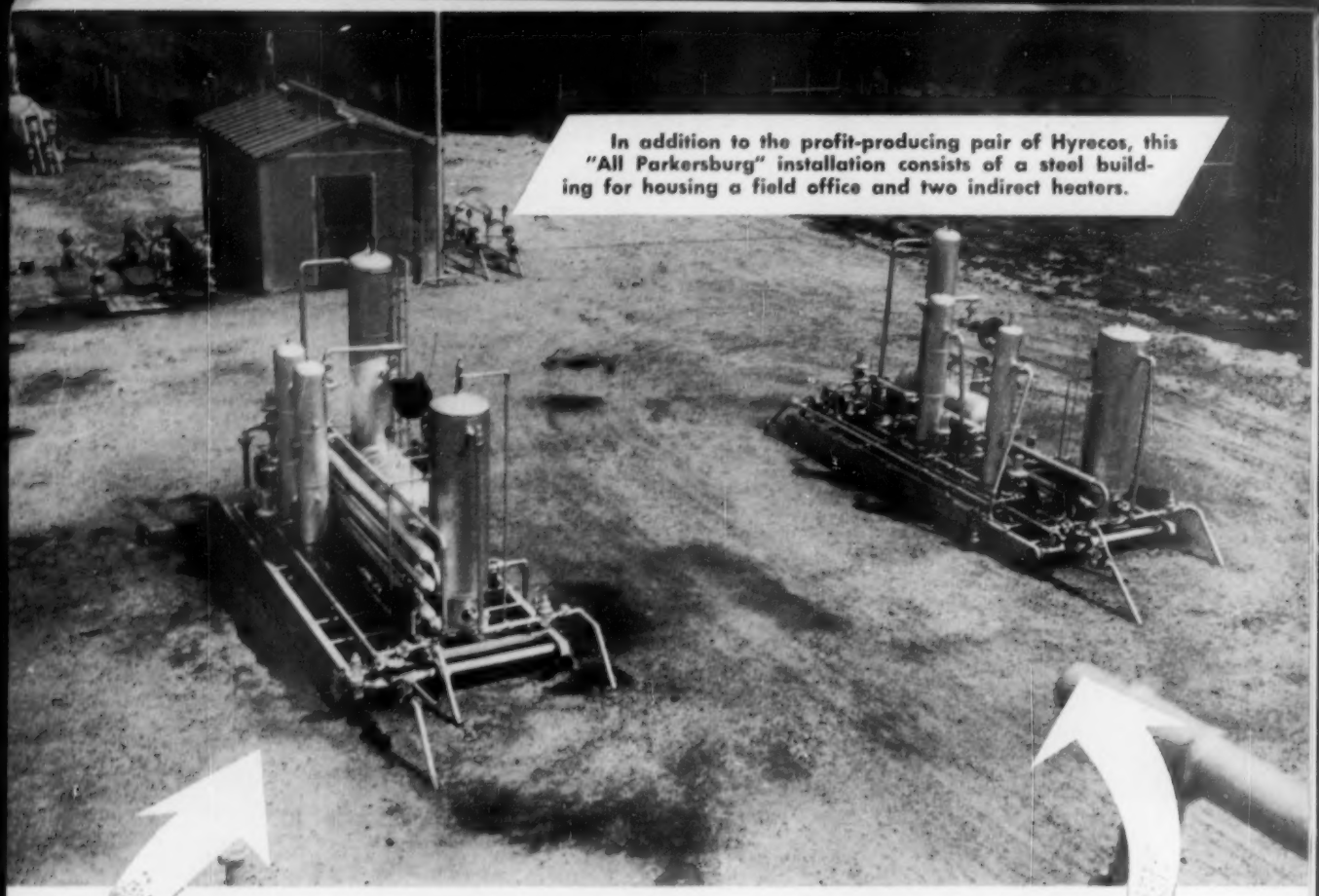
PRE-STRESSING of multiple width chain provides uniform load distribution.

SHOT-PEENED ROLLERS have greater fatigue life, added ability to withstand impact.

SHEPHERD'S CROOK COTTERS will remain in place under severe operating conditions.

PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION
CLEARANCE ON INNER SURFACE FOR EASY ASSEMBLY
PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION

FASTER COUPLING and uncoupling of multiple width chain with E-Z Assembly feature.



In addition to the profit-producing pair of Hyrecos, this "All Parkersburg" installation consists of a steel building for housing a field office and two indirect heaters.

A profit-producing PAIR of PARKERSBURG HYRECOS

Nothing in the field compares with these Parkersburg Hyrecos. They will recover more condensate per million cubic feet of gas than any comparable unit of the same price and capacity. They pay for themselves quickly out of increased liquid hydrocarbon recovery—become revenue producers in an unusually short period of time. They keep operating costs down to rock bottom by their simple design and trouble-free operation.

Their low temperature separation processes high pressure gas without freezing trouble.

Unlike other units, Parkersburg Hyrecos are custom-made from a wide range of standard elements to fit the particular flow characteristics of your gas wells. That's why they are unequaled for profit-producing performance wherever they are used. Discuss Hyrecos in detail with your Parkersburg representative.

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DIVISION OF PARKERSBURG : AETNA CORPORATION

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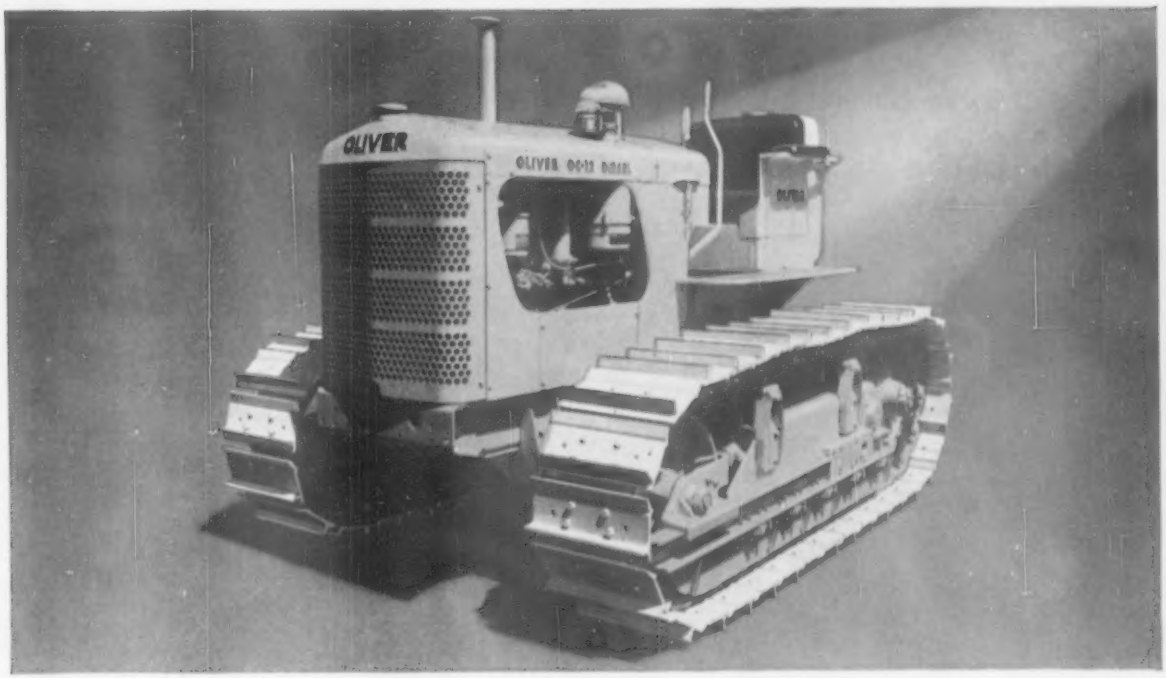
WITH POWER-TURN STEERING



Still easier to handle...more versatile than ever!

New all-hydraulic side boom makes pipe handling faster and easier than ever with *only two simple controls.* Model shown here with 12' boom has a lifting capacity of 13,375 lb. with safe and precise control of cable speeds.

Now, with many new improvements, this popular OC-12 becomes even more outstanding for sheer performance, sheer value. Here are features that let you do more work for less money on your whole range of jobs.

Power-Turn Steering gives you two independent, yet connected, systems of speed control—one for each track. You make sharper turns in the tight spots... gradual turns at *any* angle... and always with power on *both* tracks. It's more efficient on *every* move.

New over-center hand clutch gives you easier, faster, smoother shifts. It's 33⅓% larger for more positive engagement—longer lasting, too. And you *can't* ride *this* clutch!

New foot brake lets you hold the tractor easily on any grade, leaves hands free for operating other controls.

High torque diesel engine gives you over 53 drawbar h.p.—steady, dependable power—with the extra "oomph" for the most severe demands.

Your Oliver distributor is ready, too! Ask him to demonstrate. Get into the driver's seat and see the difference—on your own jobs!

THE OLIVER CORPORATION

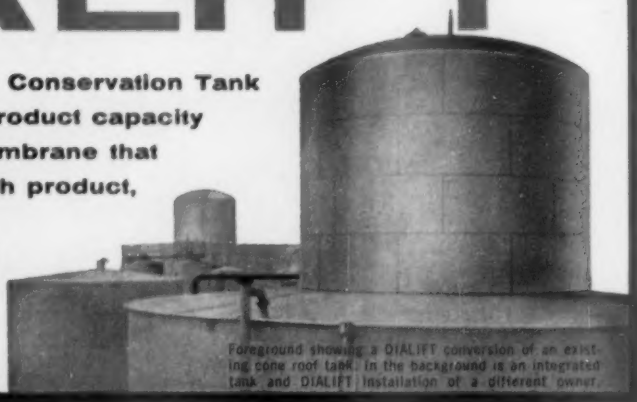
400 West Madison Street, Chicago 6, Illinois

OLIVER

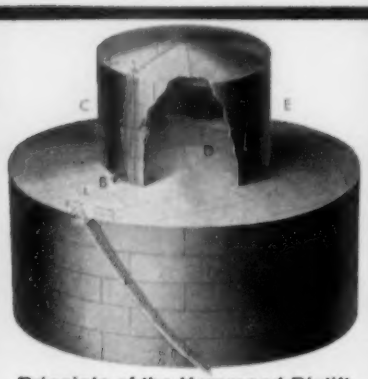
A COMPLETE LINE OF INDUSTRIAL WHEEL AND CRAWLER TRACTORS AND MATCHED ALLIED EQUIPMENT

The HAMMOND
DIALIFT

The ONLY membrane type Conservation Tank with full-rated vapor and product capacity AT ALL TIMES, with a membrane that cannot come in contact with product, vapor space that can be isolated for inspection and maintenance without taking product storage tank out of service.



Foreground showing a DIALIFT conversion of an existing cone roof tank. In the background is an integrated tank and DIALIFT installation of a different owner.



Principle of the Hammond Dialift

A— DIALIFT DIAPHRAGM rises and falls to accommodate expanding and contracting vapor.
B— Vapor passes to and from tank and DIALIFT through simple elbow connection.
C— DIALIFT and tank have full-rated capacity.
D— Membrane can't come in contact with product.
E— DIALIFT can be isolated for maintenance and inspection, product tank stays in service.

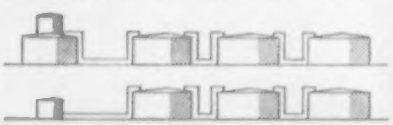
The most efficient and economical vapor conservation system for new or old tanks.

THE HAMMOND DIALIFT consists of a gas-tight Vulcalock membrane attached to the inside periphery of a cylindrical metal housing to become a "breathing" apparatus to accommodate the expanding and contracting vapor as developed in product storage tanks. The DIALIFT can be used as a single conservation unit by being attached to the roof of a product storage tank or as a central "breathing" system by being manifolded to a number of product storage tanks. There are two forms of installation: —Ground type manifolded to a number of tanks to form a conservation system and integrated type whereby the DIALIFT is attached to the roof of a product tank for vapor conservation for one or a number of tanks.

The DIALIFT is completely isolated from the product storage tank. Vapor passes between the tank and DIALIFT through a vaporline connection. It is easy to convert old cone roof tanks to efficient vapor-saving DIALIFT installations by attaching a DIALIFT housing with membrane to the roof of the old tank and connecting the vaporline between the tank and DIALIFT.

New or converted DIALIFT tank, inter-connected with cone-roof tanks, becomes central "breathing" unit.

DIALIFT GROUND UNIT serves as central "breathing" apparatus of multi-tank conservation system.



THE HAMMOND DIALIFT ELIMINATES BREATHING LOSS AND REDUCES FILLING LOSS

Other HAMMOND Bulletins describe these individual types of tanks: Floating Roof, Dioflote®, Vaporlift, Field Erected Underground, Elevated Water Tanks and Standpipes, Low Pressure, Bulk Storage.

WRITE FOR DIALIFT CATALOG 55DL

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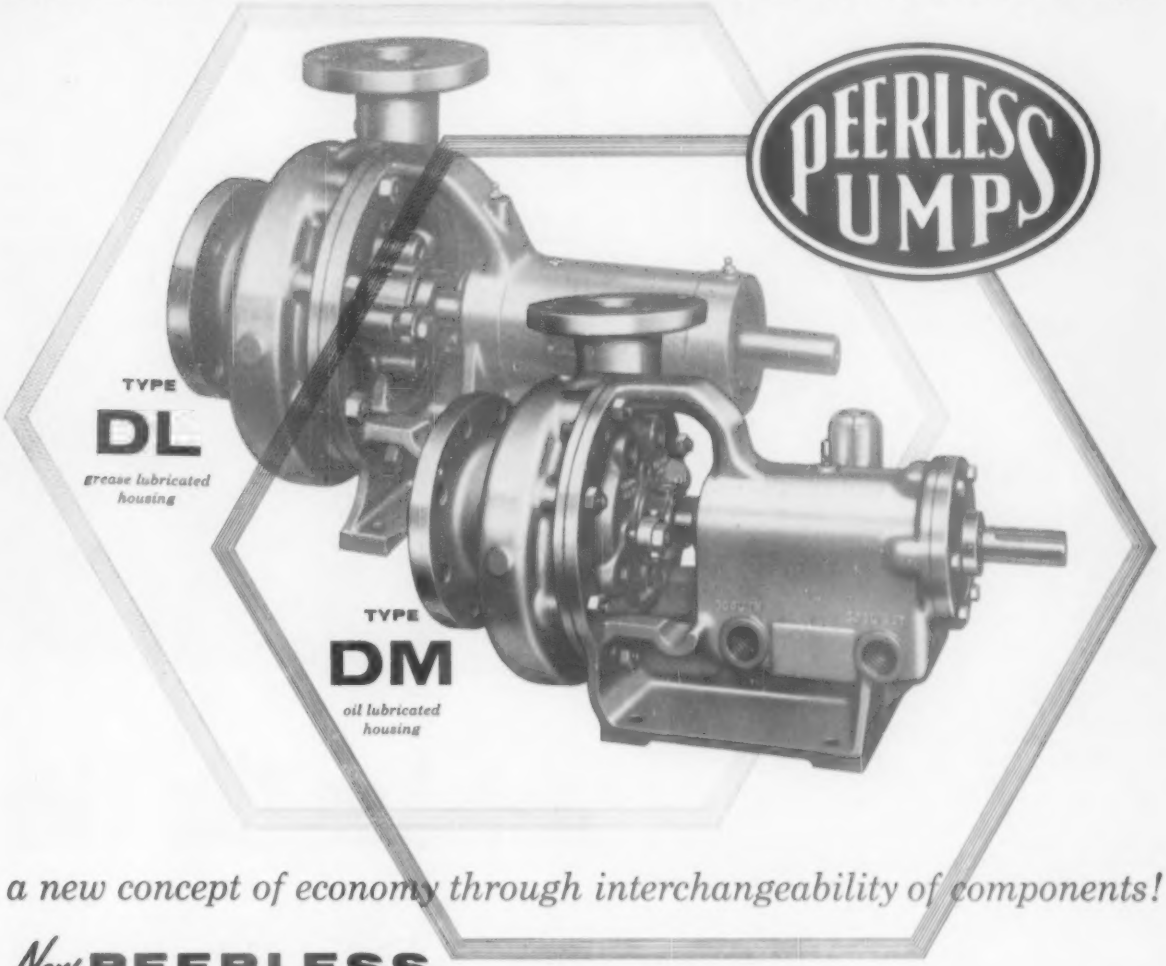
Mr. Engineer: Cut Your Pump Inventory—Reduce Costs With These New, Proved Pumps



a new concept of economy through interchangeability of components!

New PEERLESS *type* DL & DM PROCESS PUMPS ALSO FEATURE:

ACCESSIBILITY—Through ease of assembly and disassembly if and when required. **DURABILITY**—Through use of any machinable metal as materials of construction. **SERVICEABILITY**—Through designs that feature maximum ease of maintenance. **INTERCHANGEABILITY**—Through a choice of semi-open or enclosed impellers, oil or grease lubrication, air-or water-cooled back plates and bearing housings. **RELIABILITY**—Through the high performance standards set for these pumps, proving more than ever before, that Peerless Builds Dependable Pumps. **AVAILABILITY**—Through shipment from stock of both complete pumps and pump components.

Other pertinent Type DL-Type DM facts:
Peerless Type DL and Type DM process pumps are available in 1", 2", 2½" and 3" sizes on an 8½" frame and in 1", 2", 2½", 3" and 4" sizes on a 10½" frame. **CAPACITIES**: up to 800 gpm. **HEAD RANGE**: up to 430 feet. **DRIVES**: motor or steam turbine. **TEMPERATURE RANGE**: grease lubricated housing up to 250°F.; oil lubricated housing up to 450°F. **WORKING PRESSURES**: up to 400 psig.

Write for your New Bulletin now. Use coupon for quick action.

Here is
INTERCHANGEABILITY IN ACTION—

Interchangeability of component parts for DL-DM pumps is graphically shown in this Bulletin. Write for your copy. It shows how liquid end components are accommodated on either grease lubricated or oil lubricated bearing housings. Also provides quick reference to pump specifications and performance characteristics.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Factories: Indianapolis 8, Indiana and Los Angeles 31, California
Offices: New York, Indianapolis, Chicago, St. Louis, Atlanta, Lubbock and Plainview, Texas; Fresno, Los Angeles, Phoenix, Albuquerque.
Distributors in Principal Cities. Consult your local Telephone Directory.

PEERLESS PUMP DIVISION
Food Machinery and Chemical Corporation
301 West Avenue 26, Los Angeles 31, California

Please send chemical process pump Bulletin No. S-1608.

Name .....

Company .....

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OJG

REPUBLIC
Semi-rigid Plastic

...takes the Bite

Amazing endurance, ease of installation will save you money in gas lines

Republic SRK is hard to damage, can stand rough treatment from rocks, tools and handling. Impact strength is high—and over a wide range of temperatures. SRK joins fast—in four easy steps. 1. Cut pipe to desired length with ordinary handsaw or hacksaw. 2. Clean outside of pipe, inside of plastic fitting. 3. Using paint brush coat inside of fitting and outside of pipe with cement. 4. Stab pipe into fitting, give ⅛ turn and the job is done.

If corrosion is costing you money in pipe lines, here's the pipe that will virtually eliminate this problem.

It's Republic's SRK® — the rubber-resin pipe that's rapidly becoming a favorite in handling natural gas, oil, brine, water—and many other liquids.

Immune to electrolytic action, acidic and alkaline soils, Republic SRK is also highly resistant to a whole host of corrosive chemicals. Furthermore, it contains a black pigment that makes it resistant to deterioration from the sun's ultraviolet rays.

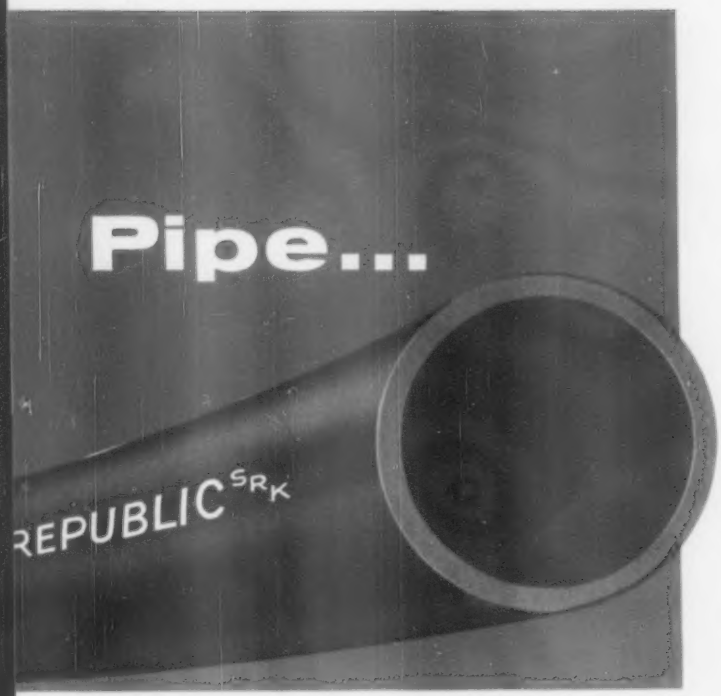
Extremely lightweight, SRK is easy to handle, transport and install. One man can carry three 20-foot lengths of 4-inch pipe and, after make-up, can ditch the line by himself. And installation costs are lower, too.

Where service replacement is necessary, Republic SRB® is the ideal insert. In diameters 1" and smaller, it is

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels



out of Corrosion

supplied in 200-foot continuous coils. SRB is sufficiently flexible to permit threading through existing lines after digging access hole at the main. Rate of flow remains high because internal friction is extremely low. Smooth interior surface resists scale accumulation, minimizes clogging.

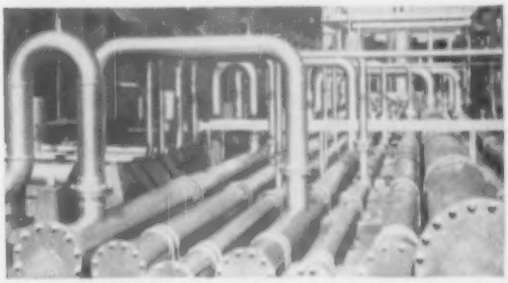
Semi-Rigid Plastic Pipe combines easily with steel. Republic has available a complete line of solvent-welded, sleeve-type fittings for making up any type of piping arrangement, whether plastic to plastic or plastic to steel.

Republic manufactures SRK in ½" to 6" sizes according to specifications recommended by the AGA subcommittee on plastic pipe. Both SRK and SRB are also available in a wide variety of sizes and schedules. It will pay you to investigate Republic Semi-Rigid Plastic Pipe. *To get the complete story, send coupon today.*

STEEL

and Steel Products

These Republic Money Savers take the bite out of costs . . .



Gas at 500 PSI puts the pressure on the alloy studs and high carbon hex nuts in these headers. But they're built to withstand the most severe heat, pressure and corrosive conditions. Clean, accurate threads provide easy tightening, maximum holding power, resistance to wear, trouble-free backoff. Ask your distributor or send coupon for details.

For big pipeline reliability, Republic Line Pipe is known throughout the industry. Electric Fusion Weld (24" through 30" O.D.) welds rapidly due to constant circumference. There are no delays searching for true-fitting ends. And high ductility assures smooth, uniform bends every time. Here's a good money-saving investment. Send for facts.

Economical Truscon® Steel Buildings erect quickly and easily. They're fire-resistant, well-lighted, properly ventilated, easy to maintain—in all, perfect for your requirements. The building shown above is one of many standard sizes and styles produced by Republic's Truscon Division—world's largest manufacturer of steel building products.

REPUBLIC STEEL CORPORATION
Dept. C-1538
3112 East 45th Street
Cleveland 27, Ohio

Please send me more information on:

☐ Plastic Pipe ☐ Fasteners
☐ Line Pipe ☐ Steel Buildings

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Company_____

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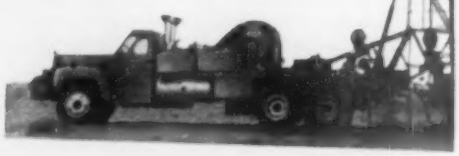
City_____ Zone____ State_____

New "all-in-one" well-servicing unit makes headlines in the oil field



From field operating reports comes news of the most advanced design in well-servicing units.

Phillips Petroleum has put together a rig that has large capacity, mobility, and ease of operation combined in a single compact unit. A 66-foot tubular steel derrick of 100,000 pounds capacity, a hydraulic pump capable of developing pressures up to the 2,000 psi necessary to raise and lower the derrick, and a single 37-inch drum winch that handles up to 6,500 feet of 2⅜" tubing or 7,200 feet of sucker rod —all operated by a 3-man crew— have been mounted on a Mack B-62SX chassis for heavy-duty operation in the oil fields.

The Mack B-62SX has power steering, air brakes, and a 10-speed transmission to meet any oil-field condition. For extra stability it is equipped with a safety brake requiring 75 pounds of air before the truck can be moved. The Mack engine operates on liquified petroleum gas with a 9.3-to-1 compression ratio, and has plenty of dependable power to operate the hydraulic pump, thereby saving the weight, space, and cost of an extra powerplant.

Why not find out how Mack can make your field or highway hauling operations more productive and more economical? Let your Mack Branch or Distributor give you the facts about Macks. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

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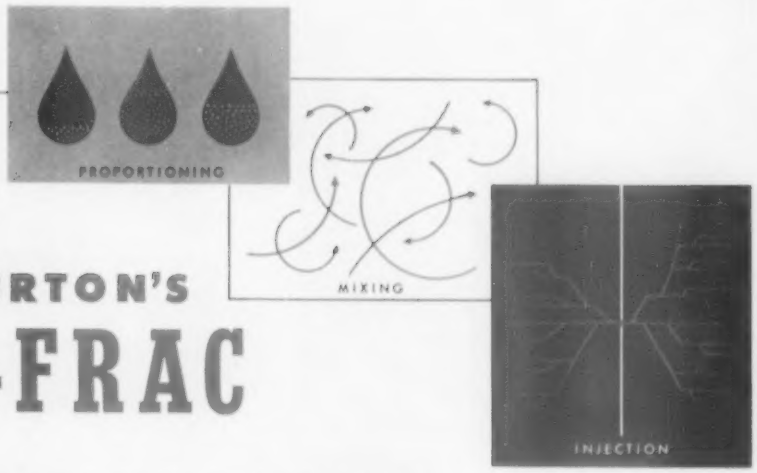
TRUCKS

4079

CONTINUOUS PERFORMANCE

GETS BETTER FRACTURING WITH LOW COST CRUDES



HALLIBURTON'S VIS-O-FRAC

Big volume hydraulic fracturing treatments may sound like big money. But that's not necessarily so. Halliburton's VIS-O-FRAC process actually saves you time and money two ways . . . by making it possible to utilize low-cost, readily available crudes . . . by continuous proportioning control, mixing and injection of the fracturing fluid. One saves material cost . . . the other saves time cost.

CONVERTS ECONOMICAL FLUIDS

Most crude oils, kerosene, diesel fuel or other light petroleum fluids are converted into excellent sand-carrying fracturing fluids by the Vis-O-Frac process, using relatively inexpensive chemicals to create a gel-like structure having viscosity and gel strength. Continuous gelation is accomplished by Halliburton's unique stabilizing device.

TODAY'S EQUIPMENT FOR TODAY'S JOB

With fracturing treatments using as much as hundreds of thousands of gallons of fluid, ordinary batch mixing won't do. Halliburton makes big-volume Vis-O-Frac treatment economically feasible by providing equipment with the capacity, the power and the controls required for "continuous performance" so essential to the ultimate success and economy of the job.

Since the use of Vis-O-Frac is not restricted as to formation characteristics or locality and has produced excellent results in gas and oil zones, sandstone and limestone, there's a high probability it will be successful . . . and profitable . . . for you. Your Halliburton operator has complete information. Call your local or district office of the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

COMPLETE DATA SENT ON REQUEST

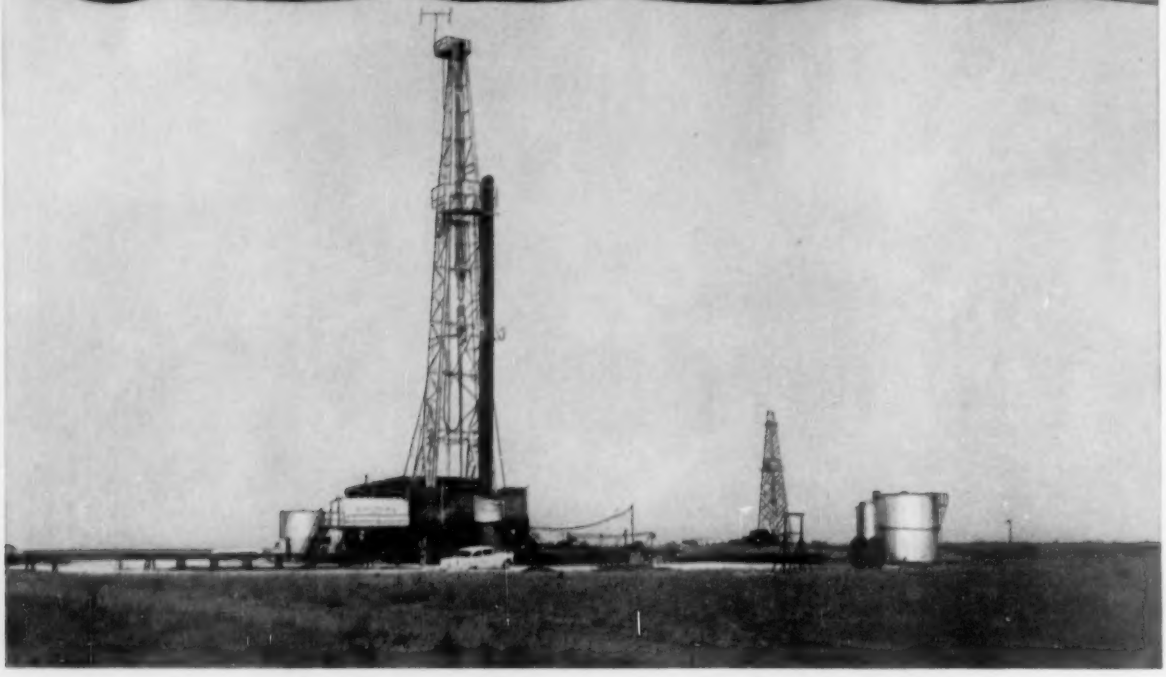
Get this valuable information for your Halliburton Service File

HALLIBURTON FRACTURING SERVICES

251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

an ACCO product

American Cable TRU-LAY VHS 15% STRONGER



Higher Safety Factor, Faster Drilling with New VHS Rotary Drilling Lines

More and more operators are learning of the many advantages of new VHS rotary drilling lines. Made from a new grade of steel for Wire Rope, they are 15% stronger than Improved Plow Steel lines, the strongest grade available before VHS was introduced.

Higher Factor of Safety

Obviously this means a higher safety factor. For example, 10 lines of VHS have a factor of safety 15% higher than 10 lines of Improved Plow Steel. In fact, 10 lines of VHS have a factor of safety equal to 12 lines of Improved Plow Steel.

Less Down Time, Faster Drilling

You can drill deeper before increasing the number of parts of line with new VHS. You can make round trips faster. And VHS' extra strength eliminates, in many cases, any necessity for regrooving sheaves or buying new blocks to use larger diameter lines for higher safety factors.

Tougher

New VHS is tougher, too. Its extra strength and toughness give it greater resistance to abrasion and higher resistance to peening . . . both important factors in maintaining diameter and shape. If regular adaptable cut-off practices are followed, ton-mile advantages should result.

Now in Winch Lines

Your nearest Mid-Continent Supply Store has Rotary Drilling Lines of new VHS in stock now. He now also has Winch Lines of this new, stronger, tougher Wire Rope. Call him today. No complicated specifications needed—just tell him the size and diameter you want.

For further information write to the nearest American Chain & Cable Company office listed below for Brochure DH-516H

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American Cable Division
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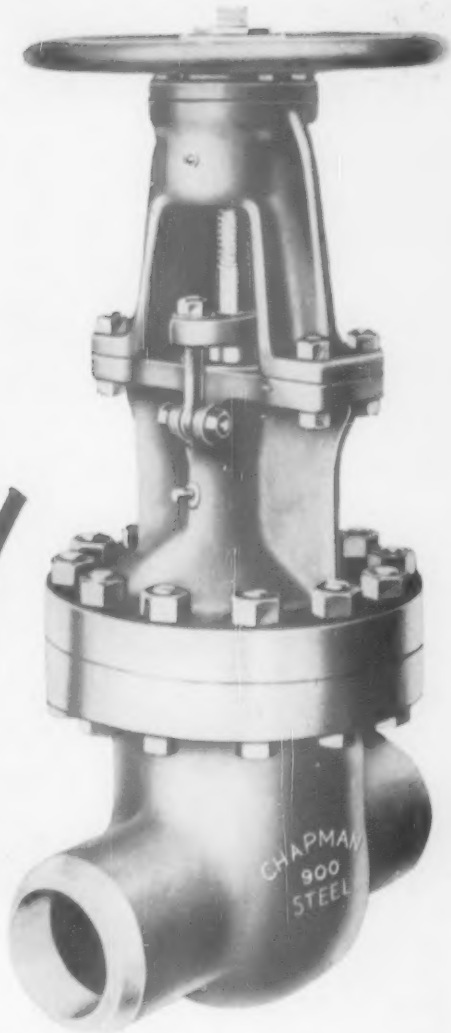
Chapman Steel Valves

Have It!

EVERYTHING YOU NEED



You want steel valves that will prove their metal under tough and varied conditions.

Chapman has them. Steel valves . . . in many different alloys . . . all carefully formulated and poured under rigid supervision in Chapman's own foundry.

You want steel valves with the smoothest operation for years of rugged service.

Again, Chapman has them. Valves that seat tightly, accurately, permanently. Valves that don't jam, chatter or wear excessively. Valves with the closest possible tolerances.

Just name your steel valve requirements. Pressure and temperature for any specified operating condition are met as you want them with Chapman Steel Valves. This includes Chapman welded, pressure seal, bolted bonnet, or valves of special design.

They all equal or exceed A.S.A. and A.P.I. standards. They all cut maintenance costs to a new low.

For your own sake and convenience, get a copy of Chapman Catalog 20 now.

THE CHAPMAN VALVE MANUFACTURING CO.

INDIAN ORCHARD, MASSACHUSETTS

ALFRED IDDLES

Portrait by Fabian Bachrach

"... 11,000, or 70% of Our Employees Are Buying U.S. Savings Bonds Regularly ..."

"The Payroll Savings Plan, a truly 'All American' thrift program has been steadily winning employee approval all over the country. Employees of Babcock & Wilcox are an example of this fact.

"As the result of a recent campaign nearly 11,000 or 70% of our employees are now buying U. S. Savings Bonds regularly on the automatic Payroll Savings Plan. They are cultivating habits of thrift and at the same time doing their share in helping to keep our economy on a sound basis. This fine program deserves strong support by every company."

ALFRED IDDLES, *President*
The Babcock & Wilcox Company

The campaign to which Mr. Iddles refers was a simple, person to person canvass that put a Payroll Savings Application Blank in the hands of *every* B & W employee. B & W employees did the rest. Your State Sales Director will help you build *your* Payroll Savings Plan. Phone, wire or write to: Savings Bond Division, U.S. Treasury Department, Washington 25, D. C.

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The Oil and Gas Journal
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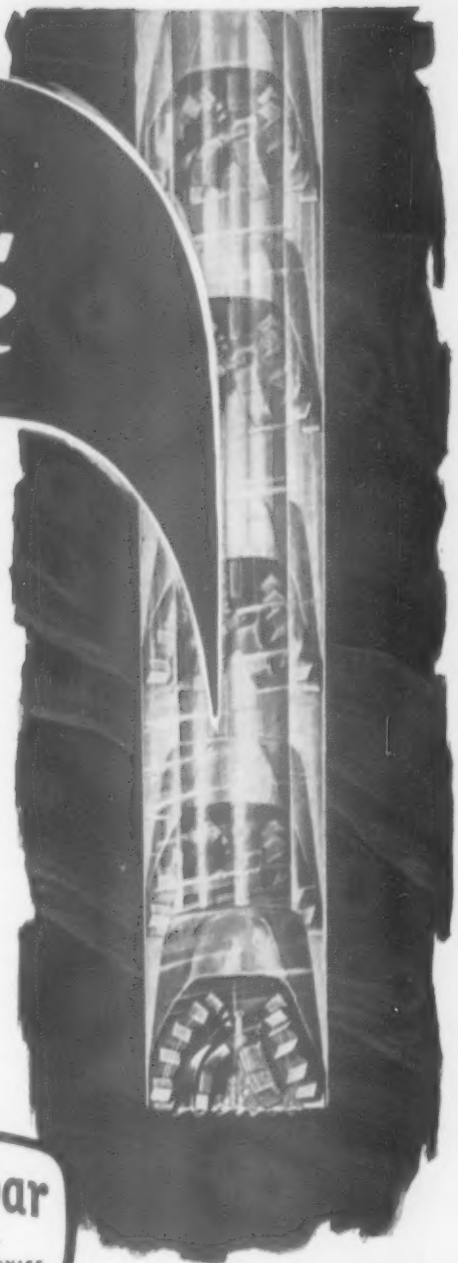
Bits go FARTHER, FASTER

...with new oil emulsion drilling fluids



You'll use fewer bits per hole, when you use the new drilling fluids, made with Aquaness emulsifiers. Here's proof: in 20 test wells drilled in the Permian basin, only 26 bits were needed per hole using the new fluids . . . compared with an average of 45 bits where water and water base muds were used.

Economies go even further. With the new fluids, you can increase penetration rates, use greater weight on the bit... cut more feet per hour. Write for a copy of the article, "New Oil Emulsion Speeds West Texas Drilling."

MACCO

LUMUL

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TRIMULSO

Magcobar

Complete

DRILLING MUD SERVICE

Drilling Milk

Supplied by leading mud companies

This new high speed drilling fluid is available from leading mud companies, under their own brands. Write to Macco about LUMUL . . . to Baroid about TRIMULSO . . . or to Magcobar about "Drilling Milk"; or call the distributor near you who handles these products.

***Aquaness Department,* ATLAS POWDER COMPANY**
2005 Quitman Street, Houston 26, Texas

Look for the Aquaness Seal

ATLAS *Aquaness Department*

on the new drilling fluids and other chemicals for the petroleum industry. It's your assurance of top performing products, made to highest quality standards and thoroughly field tested to guarantee the best in service . . . the peak in economy.

NEW! PHILCO

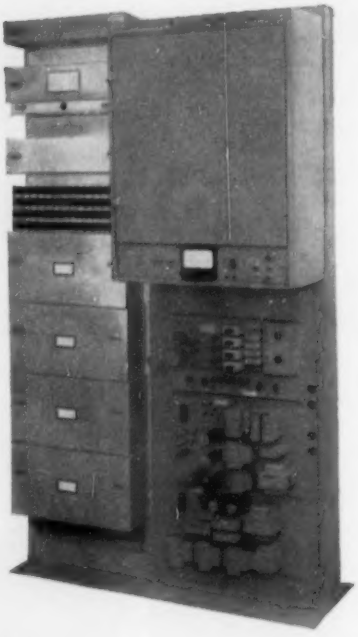
HERE are new Microwave "Packages" by Philco, pioneer in the design and manufacture of microwave systems. Each new package incorporates advanced techniques in communications and control. All components have been selected for superior performance and greatest reliability. Outstanding features of Philco Microwave Packages can lower your installation and operating costs; write Philco now for complete information.

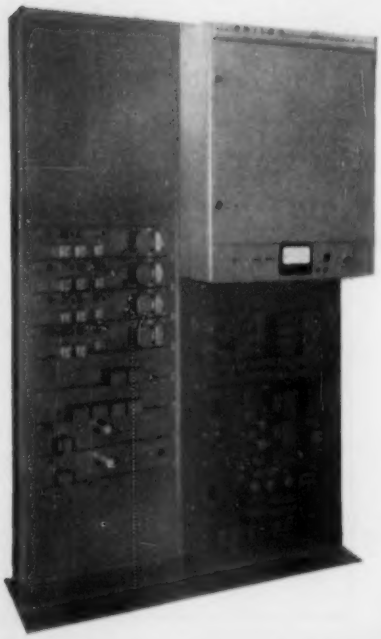
PHILCO Series 500

Philco Series 500 Package is designed primarily for pipe line and railroad companies requiring maximum dependability consistent with highest commercial performance standards along extensive right-of-way routes.

FEATURES

- Expandable to 24 or more channels (plus service channel)
- Extendable to 40 hops (1000 miles)
- Commercial quality circuits





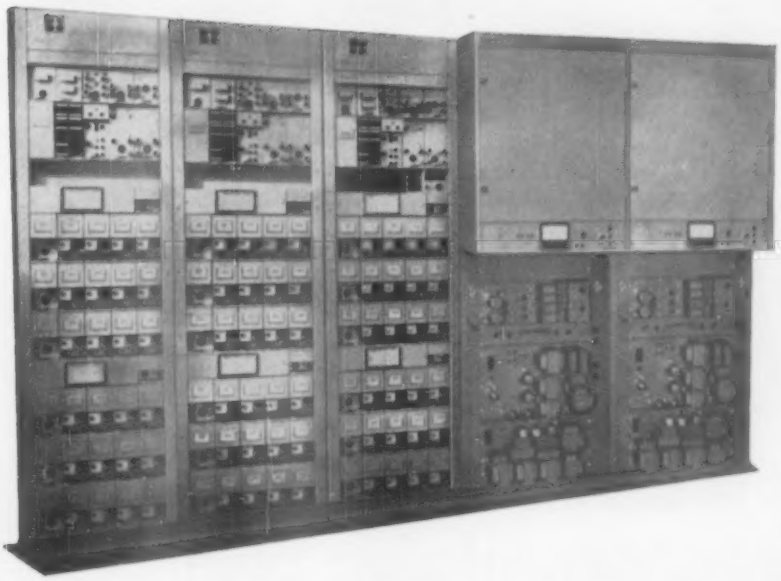
PHILCO Series 120

Philco Series 120 Package is designed to provide low cost, reliable communications over moderate distances for turnpikes, police, and utilities.

FEATURES

- Lowest cost per channel mile
- Expandable to 24 or more channels (plus service channel)
- Extendable to 10 hops
- Commercial quality circuits

Microwave "Packages"



PHILCO Series 90

Philco Series 90 Package is designed to provide the high performance and reliability required by common carriers and government agencies. Full 100% standby with completely automatic switching is included.

FEATURES

- Utmost reliability
- Expandable to 60 channels
- Extendable to 5 or more hops

Philco maintains a staff of experienced engineers to conduct surveys, plan, and install complete systems to satisfy even the most complex communications requirements. These men have successfully completed thousands of system miles, including one of the longest microwave communications systems in the world.

Write to Dept. OG for New Free Booklet

PHILCO Famous for QUALITY as Made by GI

PHILCO CORPORATION

GOVERNMENT AND INDUSTRIAL DIVISION • PHILADELPHIA 44 PENNSYLVANIA

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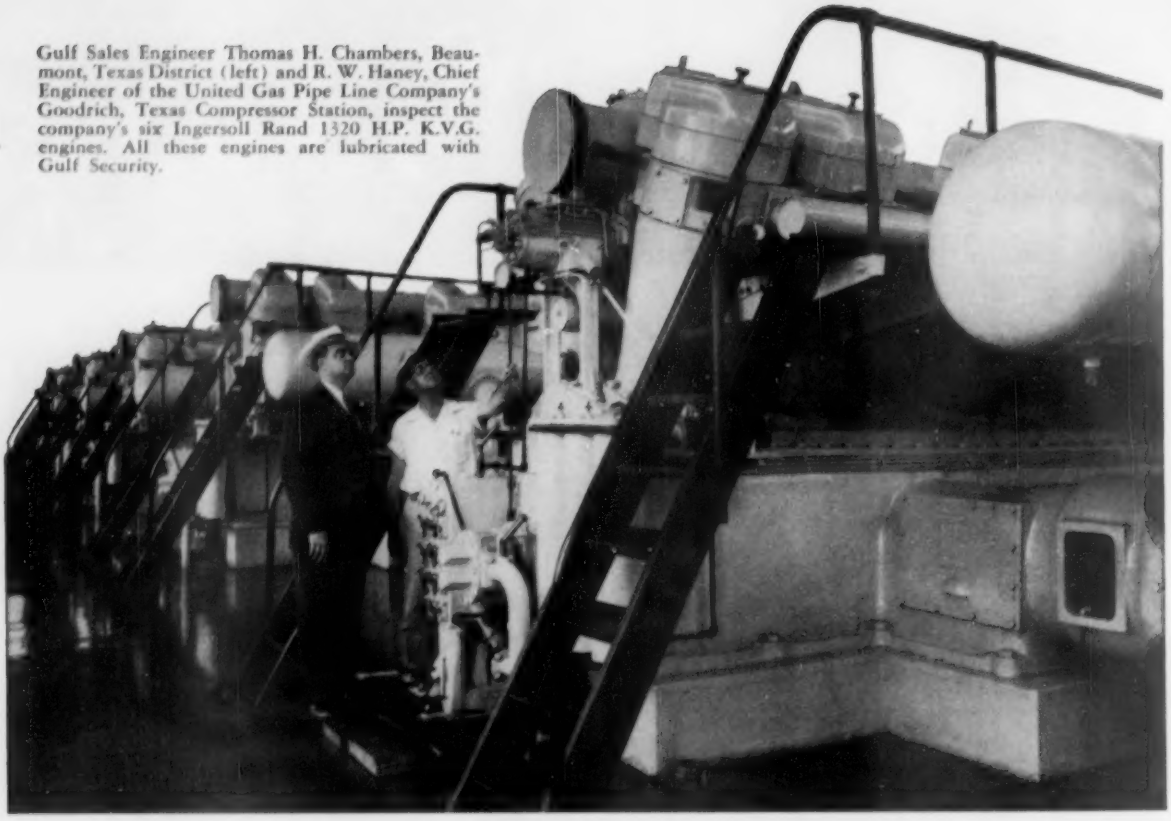


Gulf Sales Engineer Thomas H. Chambers, Beaumont, Texas District (left) and R. W. Haney, Chief Engineer of the United Gas Pipe Line Company's Goodrich, Texas Compressor Station, inspect the company's six Ingersoll Rand 1320 H.P. K.V.G. engines. All these engines are lubricated with Gulf Security.

Lock out high maintenance costs in your gas transmission plants

with GULF SECURITY

Gulf Security's outstanding record in the lubrication of pipeline gas engine compressor units is your assurance of smooth, continuous operation. In scores of gas transmission plants this high quality straight mineral oil helps prevent operating troubles and contributes to low maintenance costs.

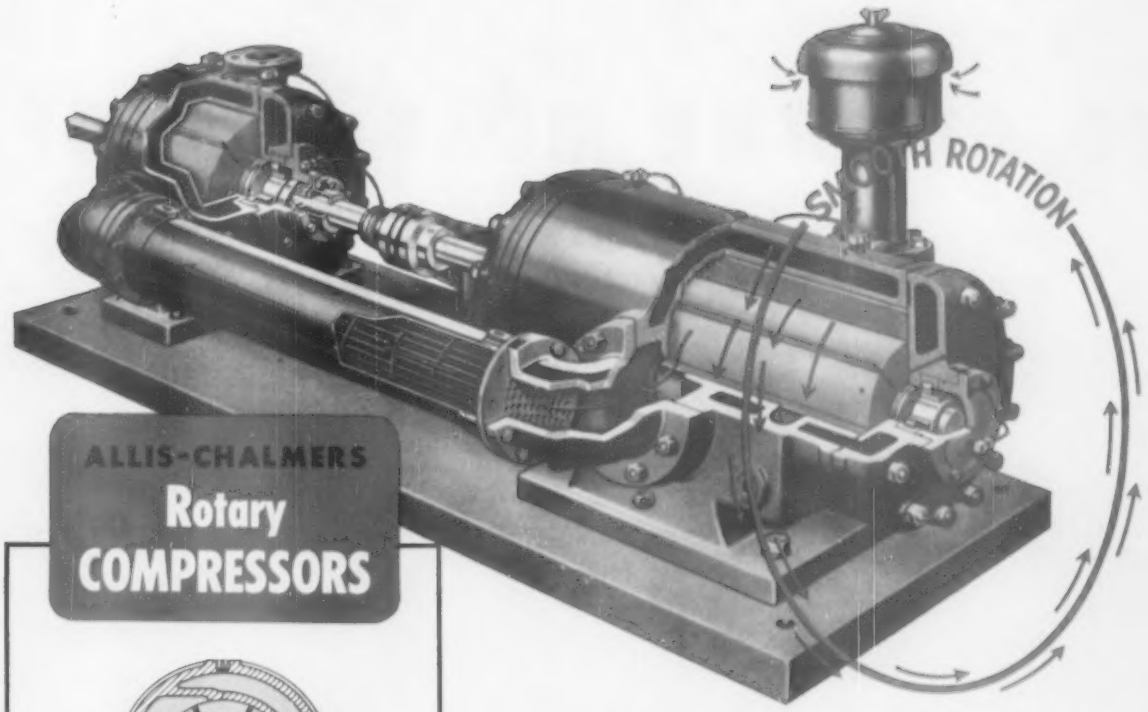
Gulf Security is a non-additive oil that does not cloud liquid filled lubricators of power cylinders, compressor cylinders, and packing glands. After years of operation with Gulf Security, cylinders and piston rings of both compressors and power assemblies show negligible wear, and its excellent oxidation stability helps prevent the formation of acid and resins in the crankcase system.

Make certain your units receive safe, effective lubrication protection—specify Gulf Security. And remember that Gulf provides the services of a trained, experienced petroleum expert—the Gulf Sales Engineer—to help you with any problem involving a petroleum product. Consult the telephone directory for the number of your nearest Gulf office.

GULF

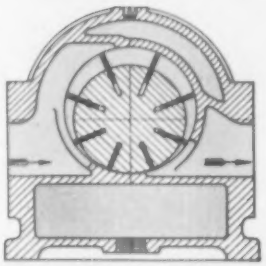
Gulf Oil Corporation • Gulf Refining Company
1822 Gulf Building, Pittsburgh 30, Pa.

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS



ALLIS-CHALMERS

Rotary COMPRESSORS



How Ro-Flo units operate: Centrifugal force moves vanes to outside wall to form air chamber.

Smooth-running Ro-Flo Compressors cut vibration, and provide...

Constant Efficiency

YEAR after year there is no change in the efficiency of a *Ro-Flo* compressor.

Efficiency always remains uniformly high even if parts wear. Here's the reason:

During operation the sliding vanes of the rotor (see cross section above) press against the cylinder wall to form air cells. Even if these vanes wear, the centrifugal force holds them in contact with the cylinder wall so that the air cell never changes and efficiency and air flow remain constant.

Rotary Means Smooth Operation

Smooth rotation cuts vibration ... eliminates need for heavy foundations. Small *Ro-Flo* units can be bolted directly to the floor. Large units need only a simple slab.

Maintenance is low. There is no wear and tear on compressors from shock and vibration ... no pistons and valves.

A Type and Size for Every Need

Single-stage units for pressures to 50 pounds gauge, and volumes from 42 to 3245 cfm. Two-stage units for 250 to 1800 cfm at pressures from 60 to 125 pounds gauge.

Single and two-stage vacuum pumps for vacuums to 0.3 inch mercury absolute from 22 to 5950 cfm.

GET INFORMATION — Call your nearest A-C office or write for bulletins 16B8244 (2-stage) and 16B8126 (1-stage). Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.

Ro-Flo is an Allis-Chalmers trademark.

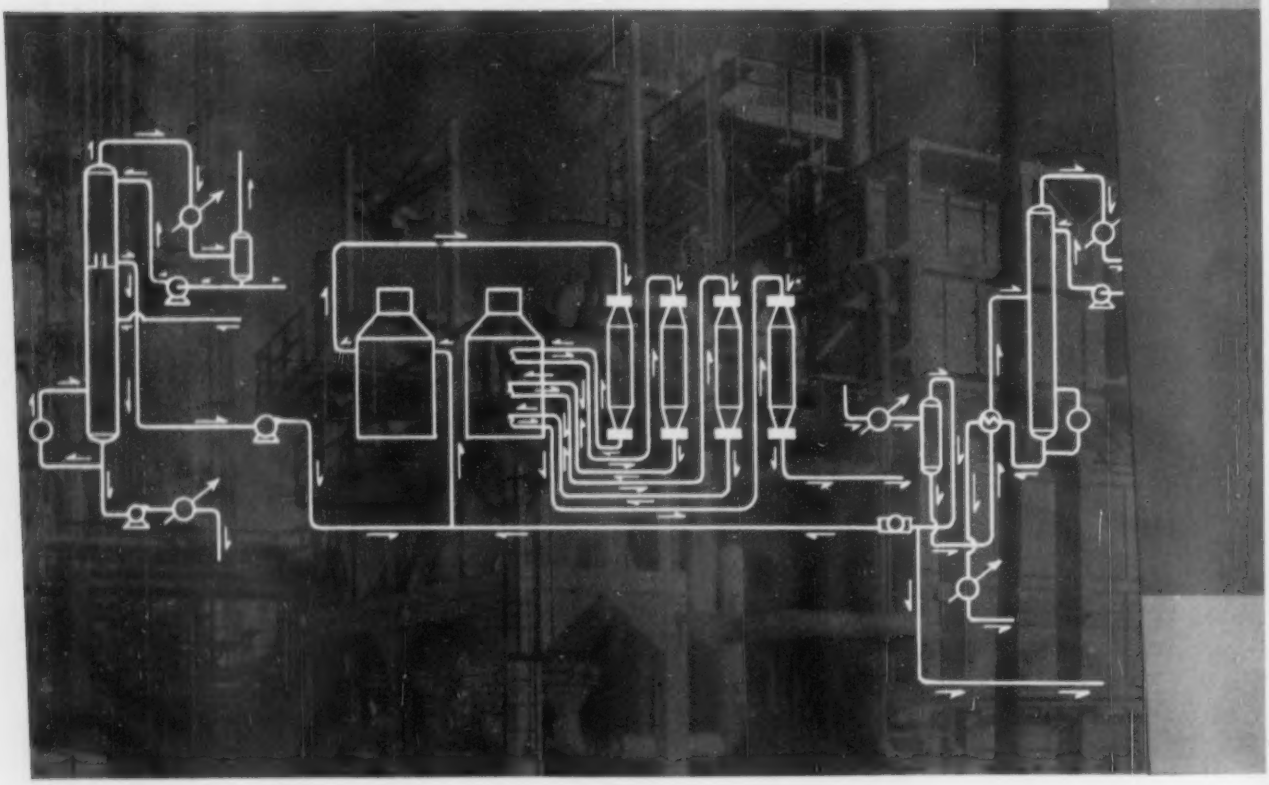
ALLIS-CHALMERS A-C ALLIS-CHALMERS

A-5134

TO GET THE MOST OUT OF

THIS IS THE GOAL OF EVERY REFINER AND HERE IS HOW UOP RESEARCH IS HELPING ATTAIN IT....

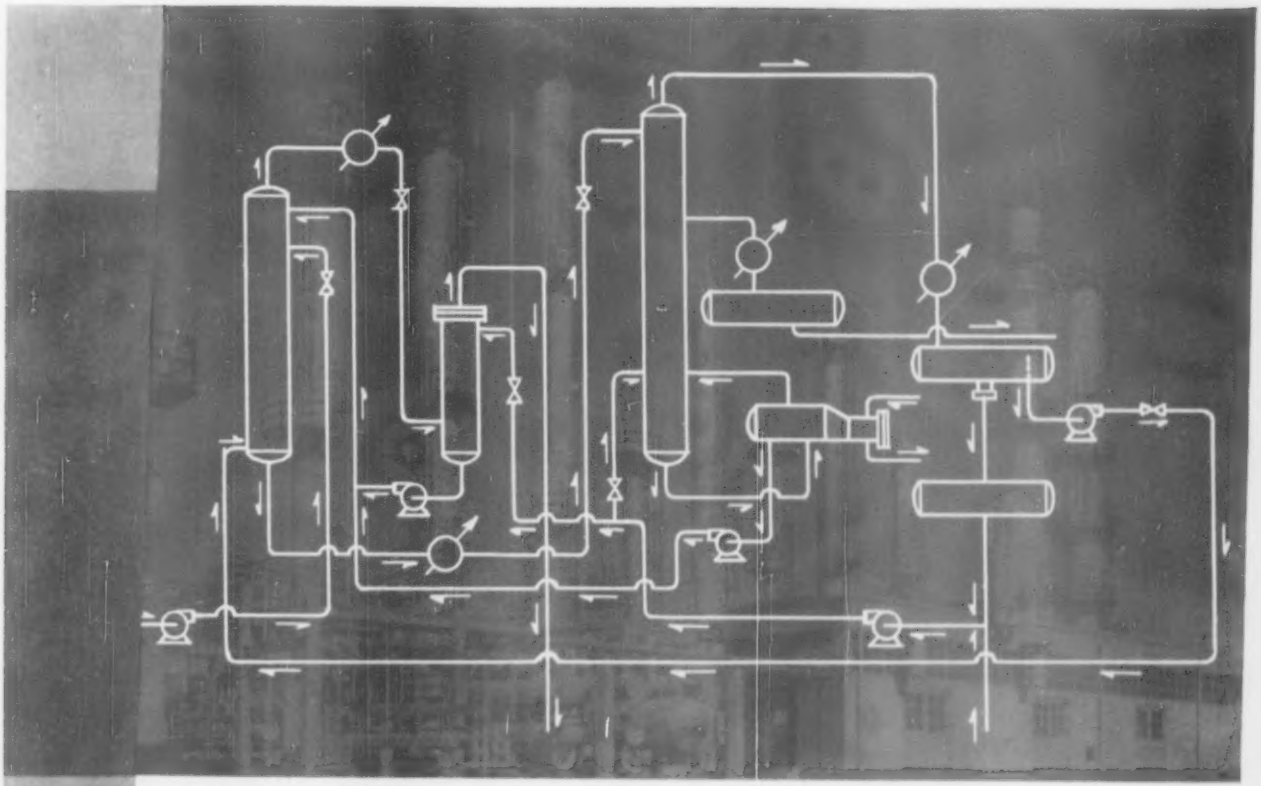
For more than forty years Universal has been developing improved petroleum refining processes, to help refiners fulfill the nation's need for motor fuels. Beyond this primary objective, UOP research has always considered the broader problem of helping the refiner get the maximum return from every barrel of oil he processes. One of our developments in petrochemicals is striking evidence of this.



Simplified flow diagram of Platforming Process

Platforming, developed by UOP and introduced in 1949, pioneered the use of platinum in a catalyst for refining gasoline and is today one of the world's most widely used processes. Early in its development, our research team realized that Platforming offered a practical means of helping meet the chemical industry's growing demand for aromatics. Experimentation indicated that, by employing certain modifications in operating conditions, high yields of aromatics were possible through Platforming. This was only a partial solution because the problem of separation of aromatics in the degree of purity required by the chemical industry still remained.

Every Barrel OF CRUDE



Simplified flow diagram of Udex Process

Udex, developed by Universal in cooperation with Dow Chemical Company, provided the answer. It successfully created and applied the separation equipment necessary to concentrate the aromatic hydrocarbons produced by Platforming into the form required by the chemical industry. This combination of UOP's Platforming and Udex processes, an outcome of a basic research program originally directed toward motor fuels, is an outstanding example of the broad scope of UOP research.

Universal research is continuing to develop and make available to all refiners, everywhere, not only new and improved processes for producing more efficient fuels for automotive engines, but also better ways of utilizing by-products from petroleum. In this way we believe we are truly helping the refiner to get the most out of every barrel of crude.

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- Grove Flexflo Valves and Regulators available in iron or steel, 1" to 12"

The only moving part of the Grove Flexflo is an expansible tube which outlasts ordinary valve mechanisms many times over. Serving both as diaphragm and valve, it is instantly responsive, and closes tightly over scale or foreign matter without leakage or damage. For compactness, high capacity in relation to size, smooth sure control, and low maintenance, specify Grove Flexflo Valves and Regulators for pressure reduction, back pressure or relief services.

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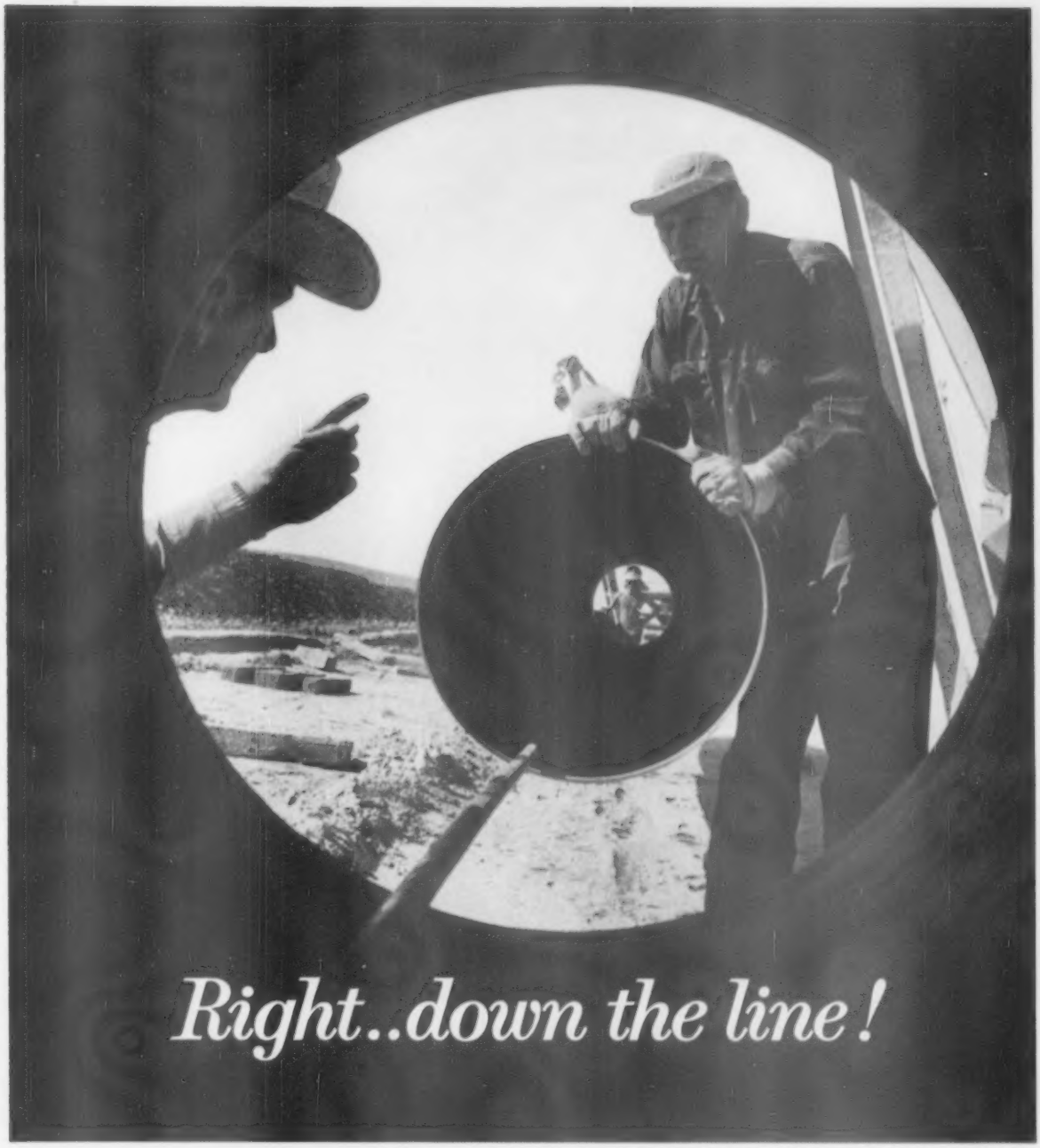

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For example, Kaiser Steel Line Pipe—20 inch OD and larger—is placed in restraining dies and expanded by water under great pressure. This hydraulic expansion assures accurate diameter, concentricity and straightness—and also strengthens the pipe through additional cold working. Another example of the painstaking care that goes into the manufacture of pipe from Kaiser Steel.

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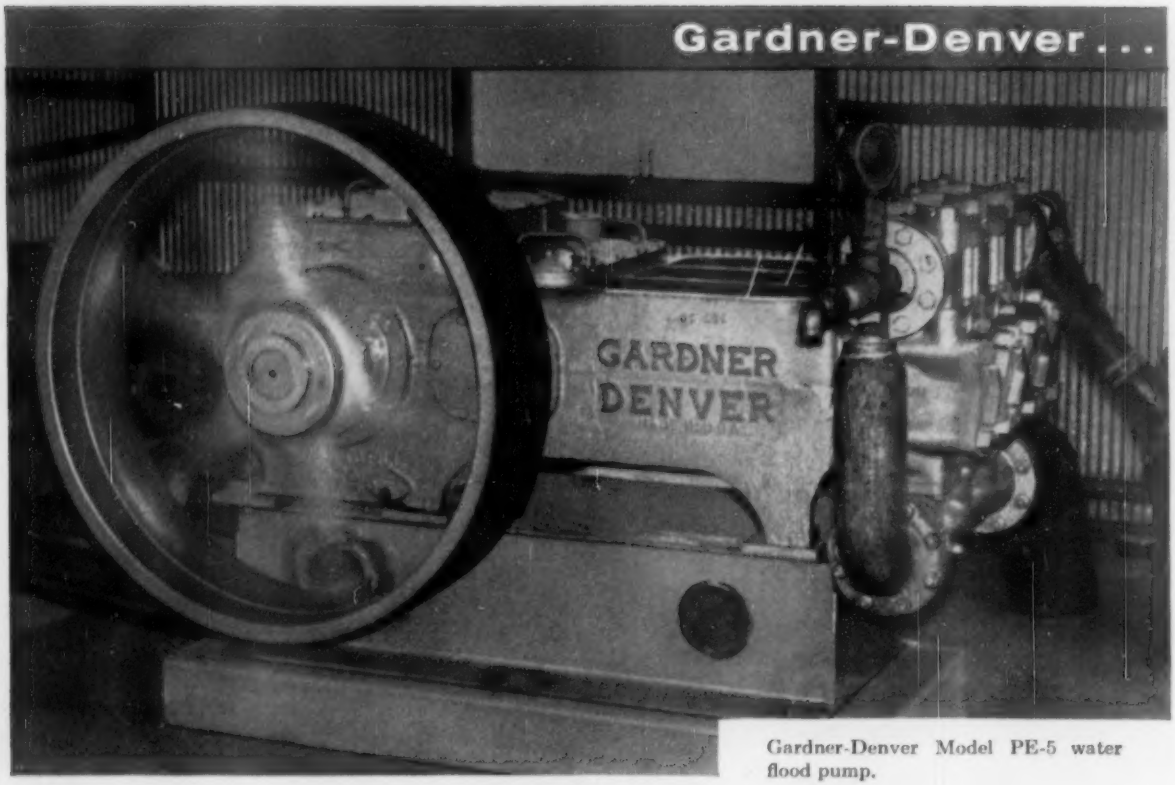

Gardner-Denver Model PE-5 water flood pump.

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CONDENSED SPECIFICATIONS

MODEL	PL-7	PA-8	PE-5	FG-FXG	FF-FXF	LE-LXE
Input hp—up to	240	160	75	,60	40	24
Discharge psi up to	3360	1455	2700	895	640	820
Bbl. per day up to	13,200	9000	7300	6000	4500	3000

Send for detailed information

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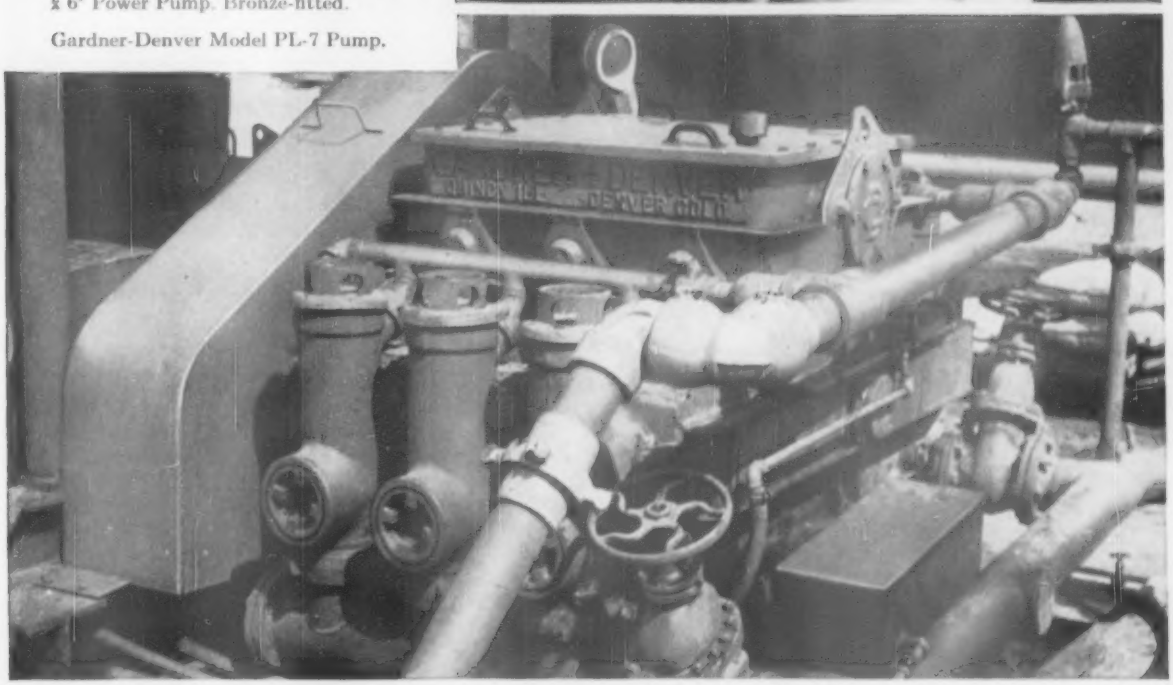
Gardner-Denver Model FG-FXG 4½" x 6" Power Pump. Bronze-fitted.

Gardner-Denver Model PL-7 Pump.



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MODEL	T-10	T-14	T-15	T-30-2	T-30-6
Diameter – in. nom.	9	11.5	15.25	15.25	16
Length – in.	9	14.12	16.75	17.25	21.75
Weight – lb.	40	95	125	135	195
Output – lb/min. (Standard Conditions)	25-40	35-65	35-65	70-95	115-175

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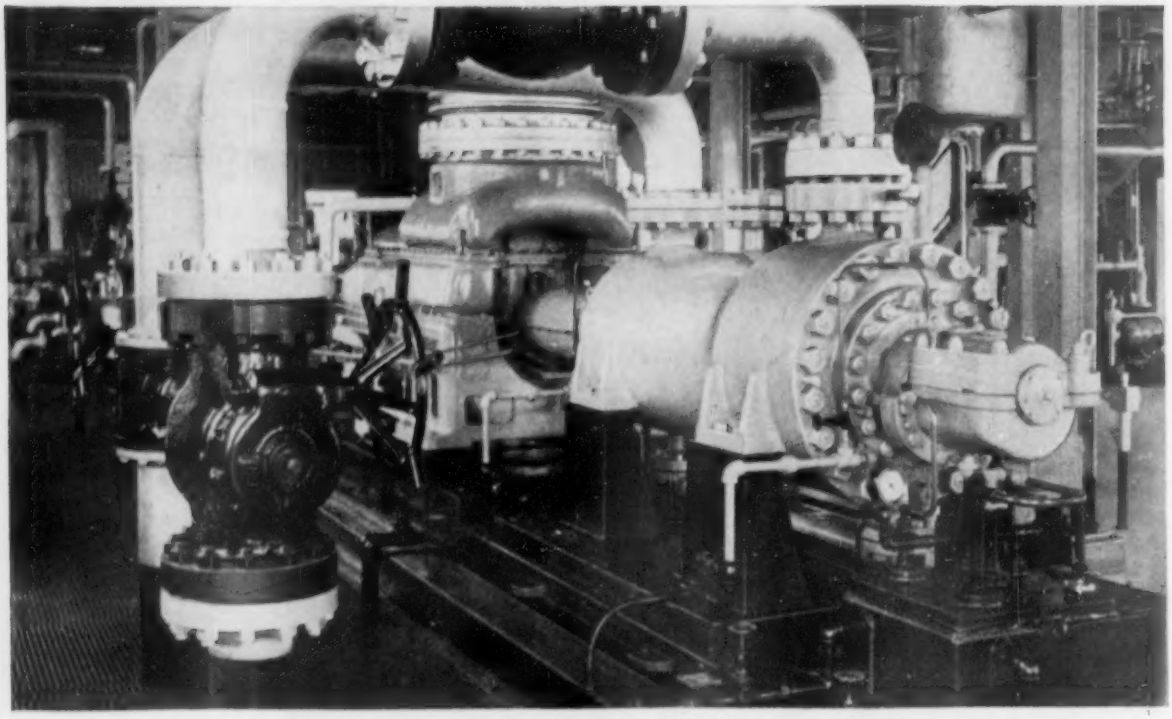
Ingersoll-Rand High-Pressure Pumps at the Katy Cycling Plant

SET IMPRESSIVE RECORD

of Maintenance-Free Operation



1943
1944
1945
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1955
1956

13 years without opening!

Two nine-stage CHT pumps were put into service at the Katy Cycling Plant in July 1943. These five-inch, double-case units, one of which is shown above, take lean oil at about 90°F. and 70 psi from the still after coolers and discharge it to the absorbers at 1850 psi. Throughout this entire thirteen year period, the pump casings have not been opened. The original bearing linings are still in service and the only maintenance required has been the renewal of inboard shaft sleeves and infrequent repacking. A third I-R pump of the same design, installed in 1944, has required no repairs to date.

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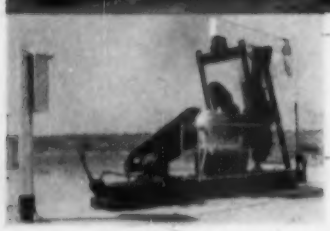
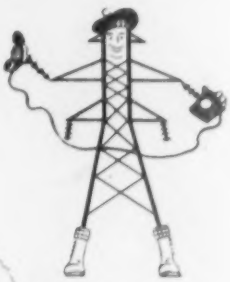
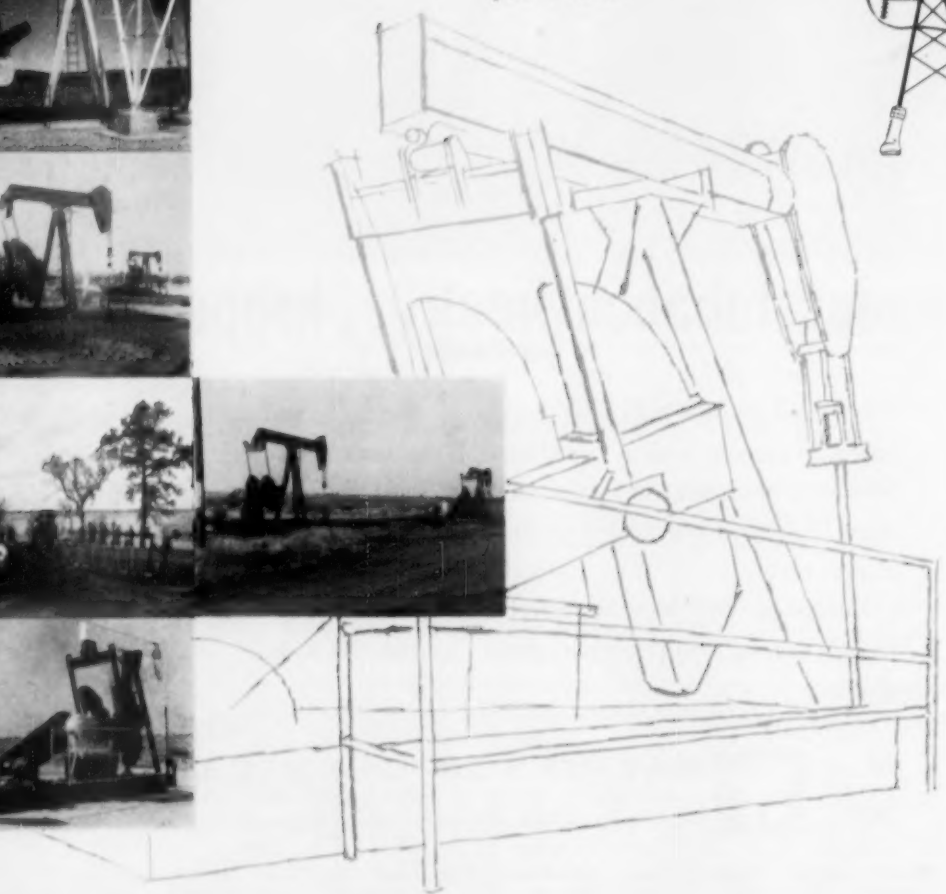


Call your nearest Electric Utility Company for power facts.





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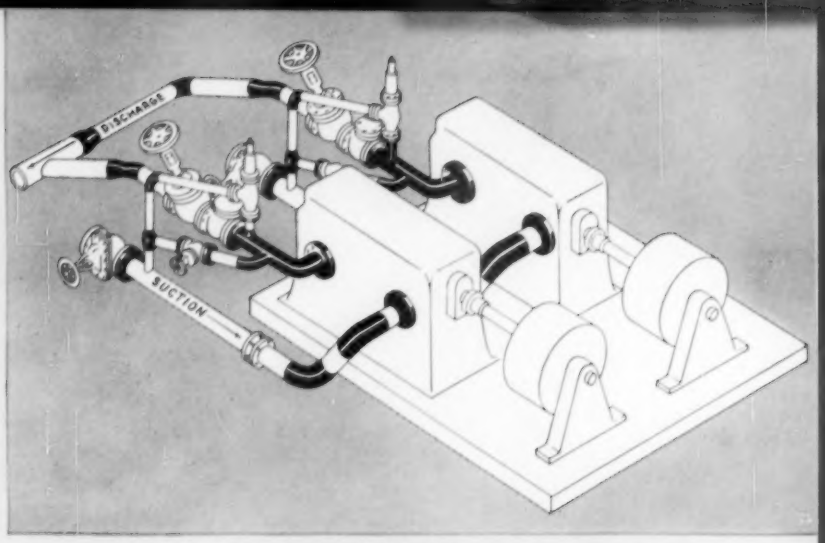
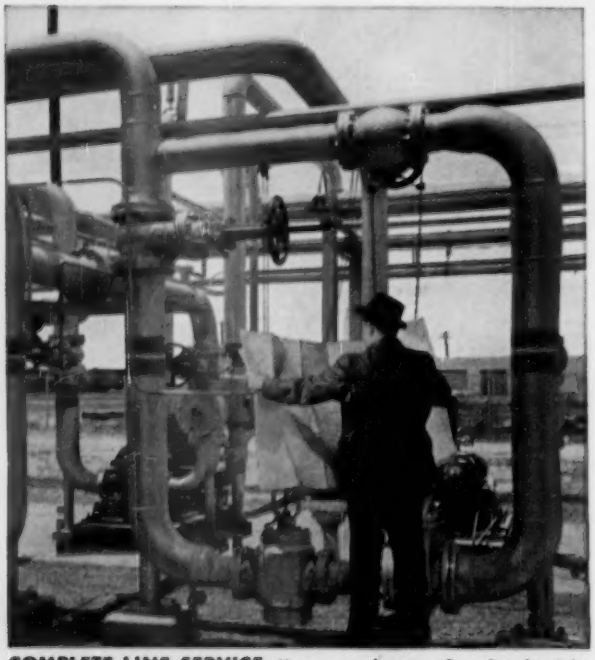


ENGINEERING SERVICE—Tube Turns' Engineering Service can help you on your piping projects. For example: Diagram above shows an application where TUBE-TURN® Welding Fittings and Flanges simplified the design and erection of pump piping. They save time, save space, and make the piping permanently leakproof and reliable. Ask your Tube Turns' Distributor to give you the pump piping recommendations of Engineering Service.



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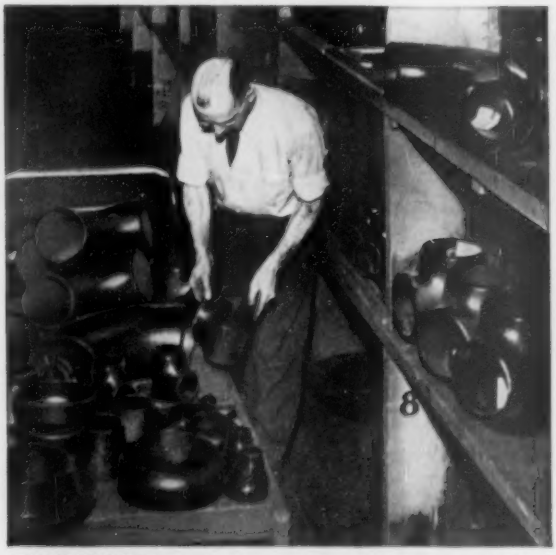

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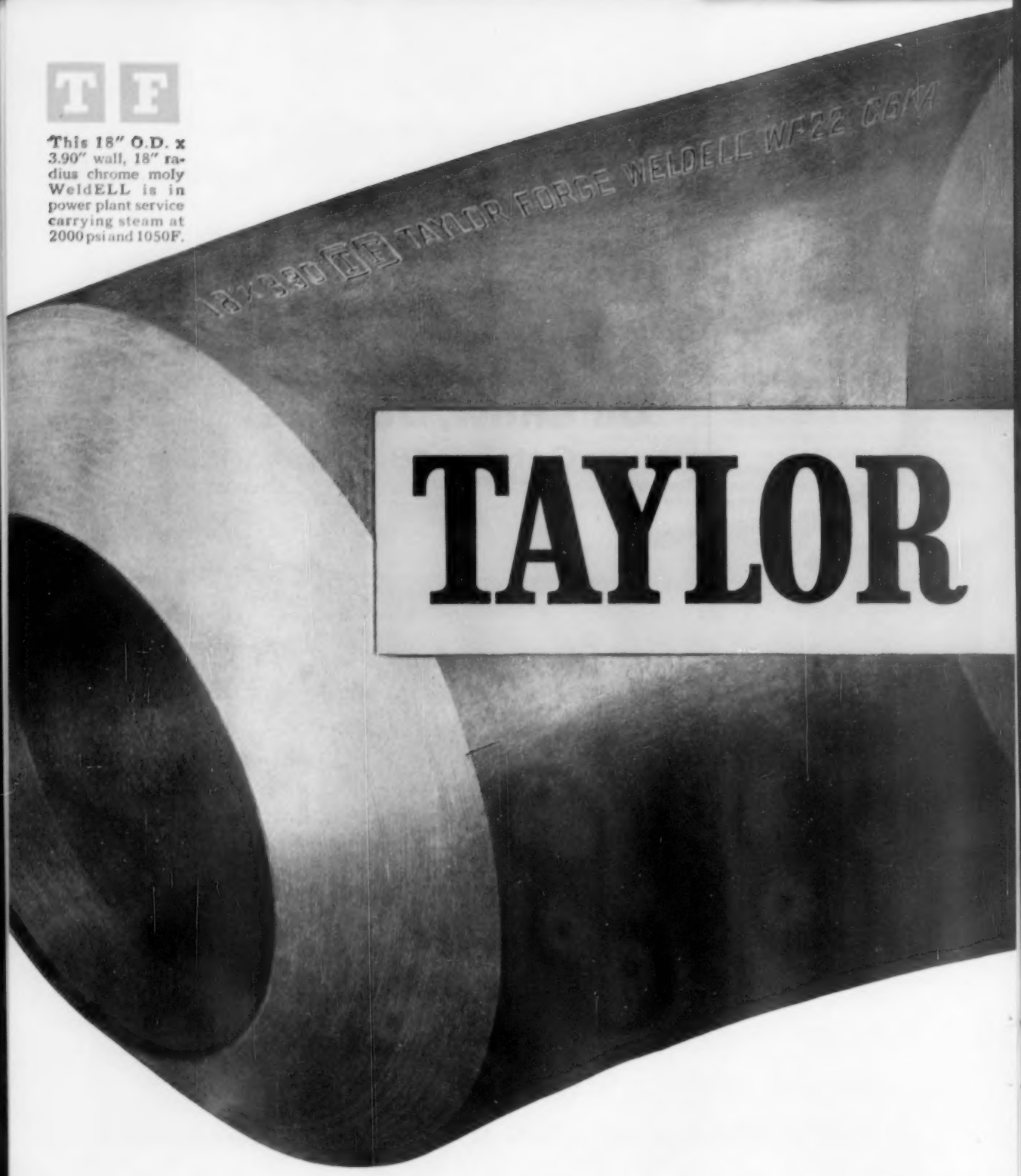

This 18" O.D. x 3.90" wall, 18" radius chrome moly WeldELL is in power plant service carrying steam at 2000 psi and 1050F.

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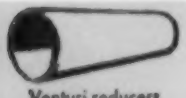
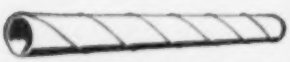

Venturi reducers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Welding necks

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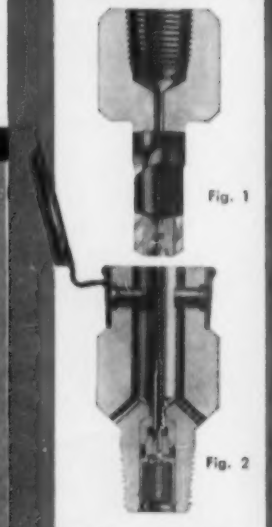
No exposure to elements
No danger of breakage, intentional or otherwise
Save the money you are now spending for gauge repairs
No investment in permanently installed gauges

How to make ONE Christmas tree gauge do the work of MANY



Connector, or upper element (Fig. 1), is attached to gauge and carried from well to well.

Gauge Valve, or lower element (Fig. 2), is installed on the tree permanently.

U. S. Patent No. 2,618,970

GAUGE VALVE AND CONNECTOR, THE MODERN, ECONOMICAL WAY TO OBTAIN ACCURATE WELL PRESSURES

Instead of one, two, or more pressure gauges to the tree, now all you need is **one gauge per gauger.** Where you would ordinarily install a gauge and valve, simply install a Thornhill-Craver Gauge Valve (Fig. 2). To obtain a pressure reading, just insert a calibrated gauge with Connector (Fig. 1) in the Gauge Valve. Half a turn engages a J-Tool and opens the valve, exposing the gauge to well pressure. Remove the gauge and the valve closes automatically. Since a single gauge is used for any number of wells, that gauge may be checked and calibrated frequently to insure accurate pressure readings for all wells. No gauge inventory. No breakage. No replacements. No repairs. Safe and easy to use. Stainless steel throughout.

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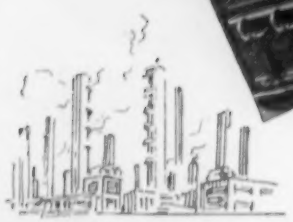
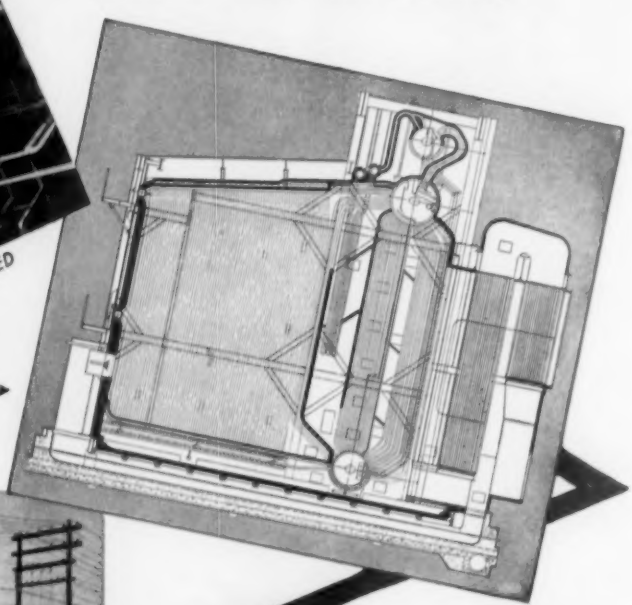
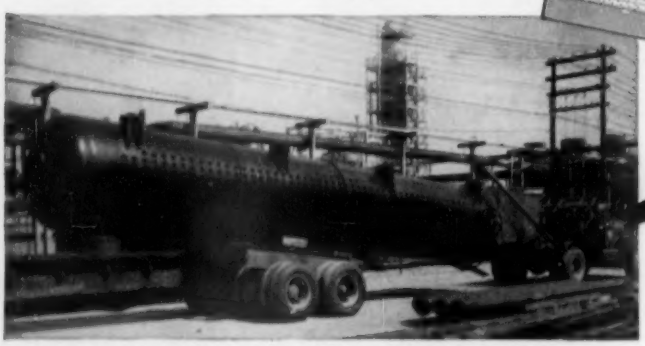
VIEW OF THE COMPLETED STEAM GENERATOR



RIGHT →
LONGITUDINAL SECTION THROUGH THE UNIT.





6'-6" DIAMETER x 37'-0" LONG STEAM DRUM BEING TRANSPORTED TO THE ERECTION SITE DURING INSTALLATION.

PRINCIPAL DATA

400,000 pounds per hour capacity.

Fusion welded steam and water drums designed for 700 lbs. S.W.P.

Superheater delivers steam at 750°F. total temperature.

Water cooled furnace.

Burners for Oil and Acid Sludge fuel.

Vogt builds a complete line of bent tube steam generators designed to burn solid, liquid, or gaseous fuels to meet specific operating conditions. Write for bulletins.

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BRANCH OFFICES: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.

Produce one or both formations with

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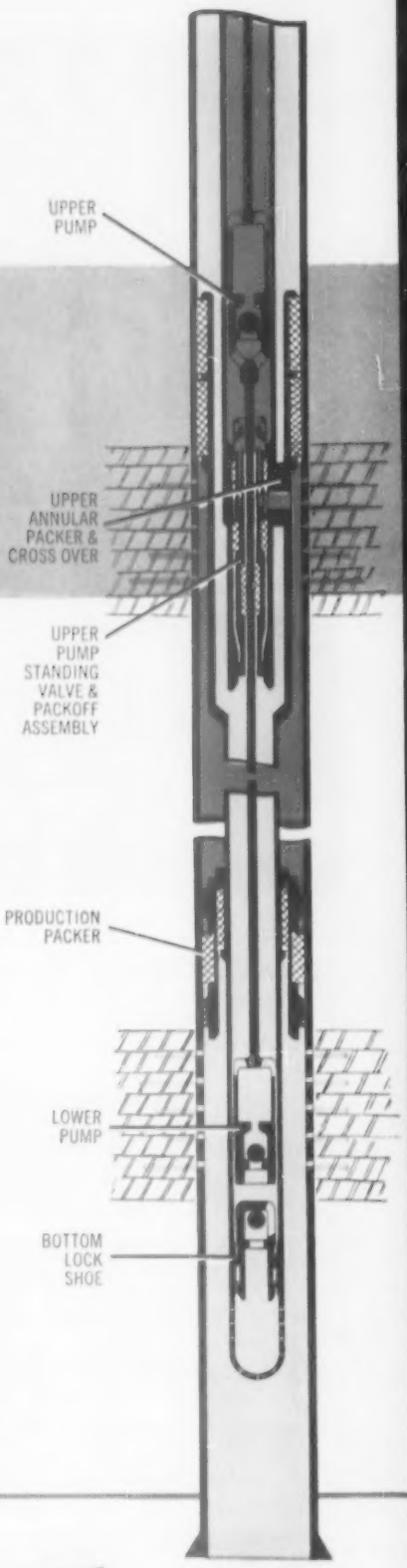
D+B OTIS TWO-ZONE EQUIPMENT



through the same well bore without co-mingling the fluids

– backed by many years of research, development, field testing and experience. All sub-surface pumping equipment can be retrieved on the rod string. Production from either pay can be accurately controlled through the use of a pump overload valve.

Check these 7 features made possible only by the exclusive "Removable Sub-Surface Choke" installed in the D + B Otis Crossover:

1. Either or both zones can be pumped or flowed independently of the other.
2. With D+B cross-over assembly in the tubing string, operator can install two-zone pumping equipment if one or both zones ceases to flow.
3. In flowing wells, either or both zones can be acidized and/or swabbed independently of the other.
4. Certain work-over and remedial operations can be performed through this equipment without removing the tubing.
5. Bottom hole temperature and pressure tests of either zone can be taken independently of the other.
6. Pump or swab potential tests of either zone can be taken independently of the other.
7. In flowing wells, tubing and packers do not have to be pulled to run either or both pumps.

On new installations, D+B will furnish, at no additional cost to the customer, capable and experienced personnel to properly install the D+B Otis Two-Zone Equipment. *Call your nearest Continental or D+B store for new illustrated bulletin.*

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Serving the Oil and Gas Industries

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Leading Manufacturers of Pipe and Tank Flanges and Commercial Forgings

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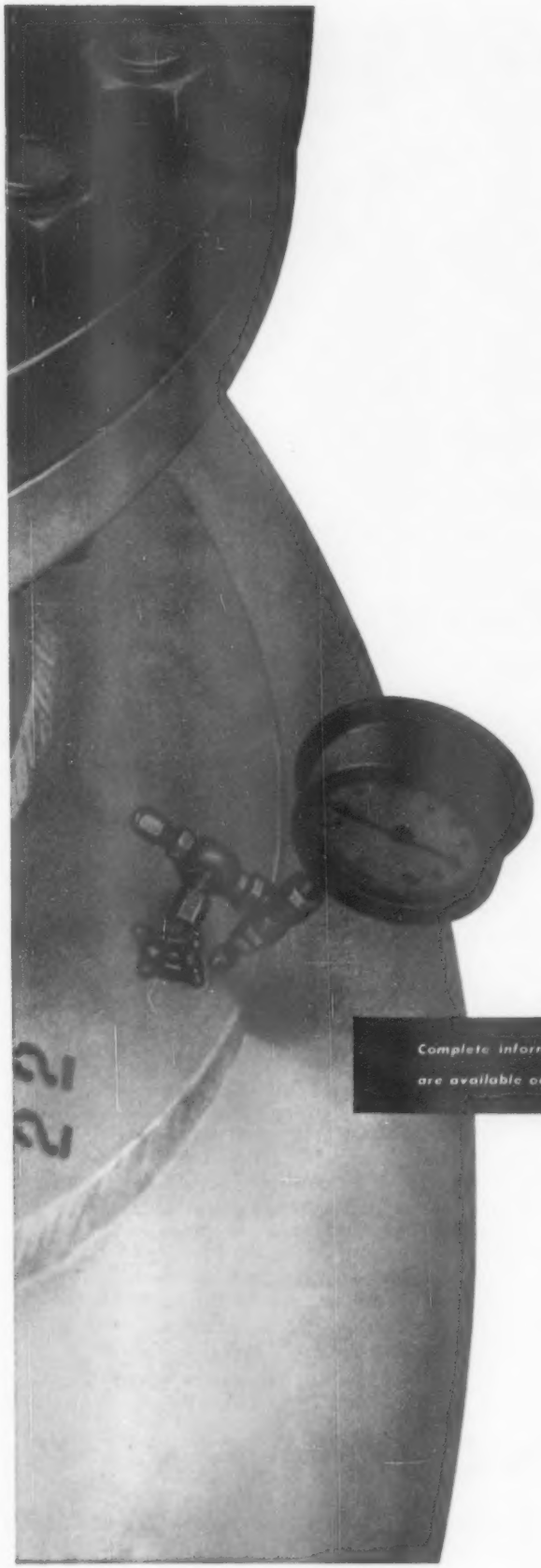

THE PROBE PROVIDES THE PROOF

proof that Kontol corrosion inhibitors effectively protect against hydrogen blistering in fractionating systems associated with catalytic cracking units. In case after case, the use of Kontol reduced hydrogen penetration, as indicated by probes, from a 20 to 25 psi build up per eight hour period to the 0 to 3 psi range. In addition, in every case, blistering was materially reduced or arrested. Metal losses were reduced in the 70% to 90% range and, due to Kontol's powerful detergent action, fouling and scaling on condensers, towers and exchangers became negligible.

Complete information and instructions for the fabrication of a hydrogen probe are available on request from the Tretolite Company.

Kontol is an effective corrosion preventive in virtually every major element of refining equipment. For complete information ask the Kontol service engineer in your area, or write to

TRETOLITE COMPANY

A DIVISION OF PETROLITE CORPORATION
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5515 Telegraph Road, Los Angeles 22, California
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Chemicals and Services for the Petroleum Industry

DEMULSIFYING, DESALTING, CORROSION PREVENTING, WATER DE-OILING, PARAFFIN REMOVAL, SCALE PREVENTING, PRODUCTION STIMULATING

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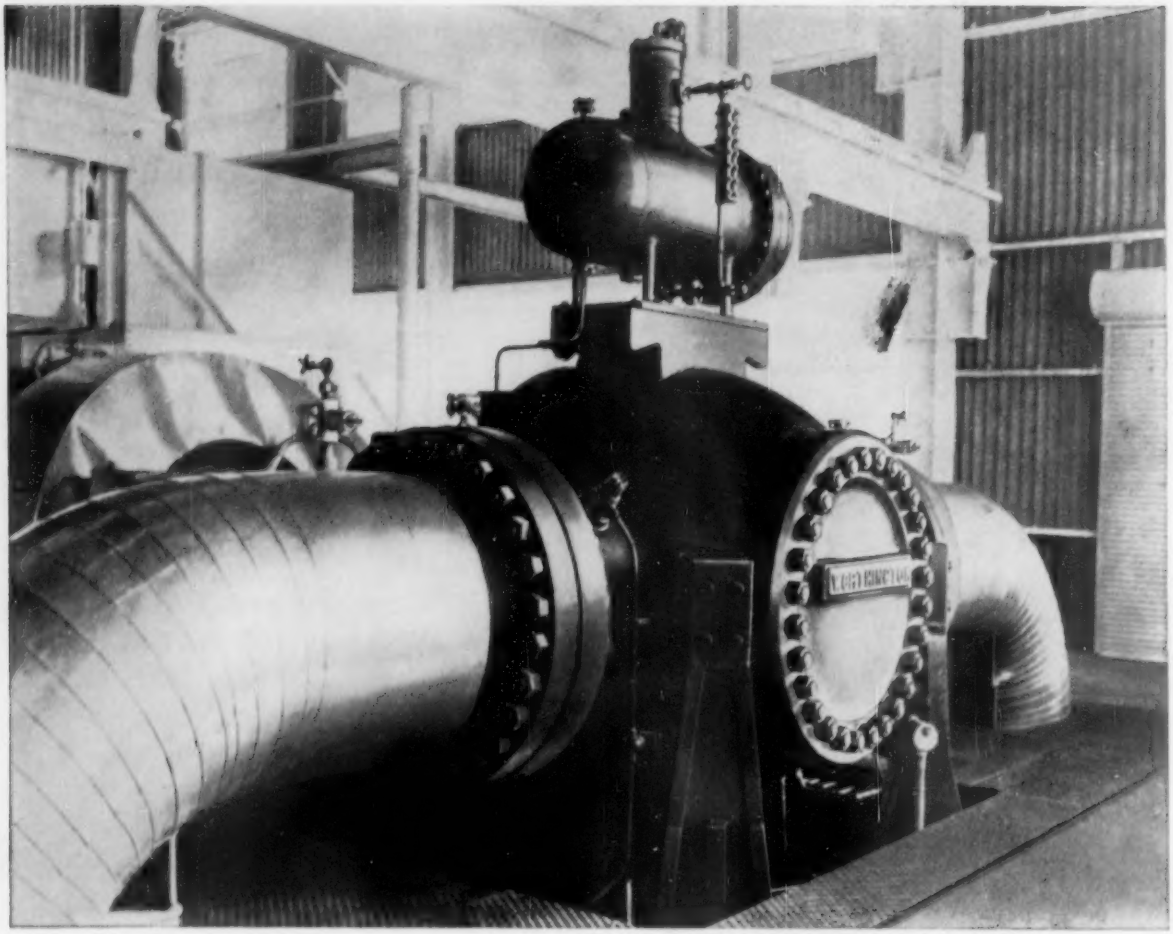

First "Center Line" Centrifugal Booster completes 18 months of pipeline service

Records show "practically no maintenance required"

This "new design" gas pipeline compressor has more than lived up to its advance billing. In service at Northern Natural Gas Company's Macksville, Kansas, station, since December, 1954, it has averaged 800 million cubic feet per day at a pressure of 500 psi. Records show that it has required practically no maintenance.

A brand new idea in compressor design, Worthington's type GUP compressor has a spherical casing supported at the center line. As a result, shaft distortions are minimized, starting stresses reduced, and bearing life extended.

A separate compressor driven pump supplies oil pressure at all times. By adding a cooler, the system may be made completely independent of the driver. A double trap in the scavenging system insures that no seal oil will seep into the gas stream.

It's easy to inspect. No internal part is too heavy for one man. The lightweight impeller, for example, weighs only 100 lbs.

If you'd like more information about this new pipeline compressor, write for bulletin C-1100-B57 to Section E66, Worthington Corporation, Harrison, N. J. In Canada: Worthington (Canada) 1955, Ltd., Toronto, Ontario.

E-6.6

WORTHINGTON

He's not on The Oil and Gas Journal payroll . . .

but he helps us help you do a better job

This man is an auditor—one specially trained in the examination of circulation records. He has "the right of access to all books and records" in verifying the subscriptions you and thousands of other Oil and Gas Journal readers order and pay for. The organization he works for is a cooperative association made up of publishers and advertising men called the Audit Bureau of Circulations. This organization was founded in 1914 to establish circulation standards for *paid-circulation* publications . . . and to audit and report only the *facts*.

How does the ABC auditor help *us* help *you*? By keeping us on our publishing toes. His audited reports are a measure of how well we're serving you. To keep you as a subscriber—year after year—The Oil and Gas Journal *must* provide a service worth your money. (Obviously, there is no comparable discipline for publications nobody pays for.)

Of course, the degree to which we hold your interest—as verified in the ABC report, showing the number of *paid* subscriptions and the percentage of renewals—is what interests advertisers, too. For the rate they pay for the space they use is based on The Oil and Gas Journal's *paid* circulation.

Thus the ABC symbol is a constant reminder that (1) *your interests* come first at The Oil and Gas Journal and that (2) The Oil and Gas Journal advertisers get what they pay for—*your interest*.

LOOKING FOR EXTRA OCTANES?

...they've been found with

AEROCAT® CATALYSTS

A survey of 42 cat crackers showed that those using Aerocat were averaging 2½ octanes higher than comparable units operating with natural catalyst! But extra octanes are only one of the benefits assured by Aerocat. High throughput, low stack loss and excellent stability contribute to the high overall efficiency.

Equally important... behind AEROCAT'S efficiency stands

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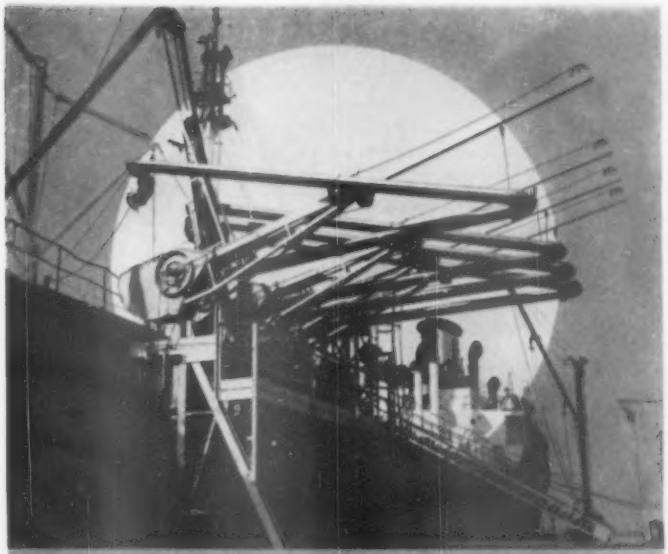
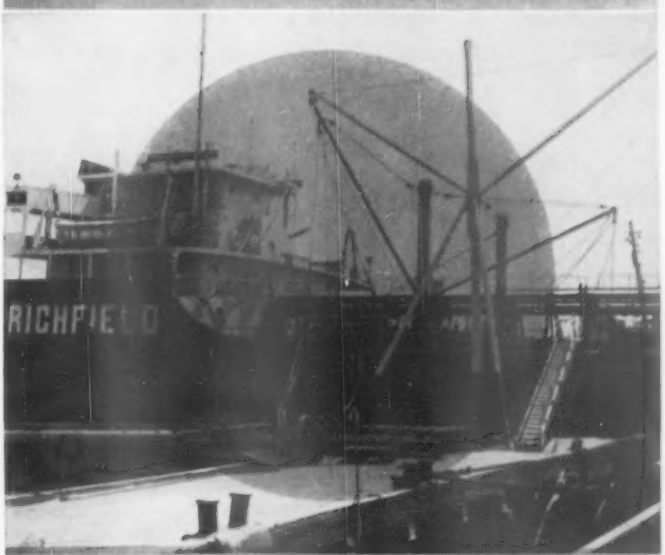


NOW—One man operating simple controls swings Chiksan Loading Arms into hook-up position in one minute. Note spotless condition of the dock.



BEFORE—Unwieldy dock hose was difficult to make up, was hazardous, cluttered the dock and was subject to spillage.

RICHFIELD TERMINAL GOES MODERN WITH CHIKSAN MARINE LOADING ARMS

Safety. Economy. Speed. These three major factors were carefully weighed by Richfield when they evaluated the new Chiksan Marine Loading Arm. On each point the new Loading Arm measured up and more.

Take safety. The majority of marine loading mishaps are back injuries resulting from handling heavy rubber hose. The new hydraulically operated loading arm eliminates this costly hazard. Hose bursts, while less common, are extremely dangerous, terrifically expensive... one burst cleanup could easily cost more than an entire 5-arm unit. The new Chiksan Loading Arm has a burst ratio of 8 to 1 compared with rubber hose 4 to 1 ratio.

From a speed standpoint, it takes 3 men just 7 minutes to make up the Chiksan Loading Arm compared with 7 men taking 24 minutes with rubber hose. Loading operations can be speeded up, materially reducing turnaround time.

And from the all important economy viewpoint, the new Loading Arm means substantial savings in lost man-hours due to injuries, insurance and compensation premiums, and expensive rubber hose replacement costs. Savings that within a decade will actually amount to the purchase price of the Loading Arm.

CONSULT CHIKSAN NOW

If your planning includes a new dock, Chiksan will provide specific detail so that installation requirements can be included in the original plans. If it's an existing dock, Chiksan will tailor loading facilities to meet your requirements.

CHIKSAN

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

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"In the petroleum industry, research makes for higher efficiency and lower costs, for new discoveries and better processes, for a greater yield of valuable products from each barrel of crude oil. Jersey and its affiliates now support eight research centers, employing over 2,800 scientists and service personnel dedicated to discovering new and improved methods of finding, producing, processing, and using oil and oil products."

—M. J. Rathbone, President, Standard Oil Company (New Jersey)

ESSO

STANDARD OIL COMPANY (NEW JERSEY)
AND AFFILIATED COMPANIES

Use SpringKore flexibility and crush resistance to cut your rotary drilling line costs

J&L SpringKore Rotary Drilling Lines are designed with a tightly coiled, high quality steel spring center that replaces independent wire rope or hemp fiber core. The SpringKore center gives rotary drillers a wire rope with unusually high resistance to crushing action *plus* extreme flexibility.

Check these SpringKore features and see why J&L SpringKore gives you longer service life on your rotary rigs.

LONG-TERM FLEXIBILITY
SpringKore's highly flexible center and wide distribution of internal pressures maintains original rope flexibility under long periods of heavy-duty service.

RESISTS CRUSHING ACTION
Coiled steel spring center has great resistance to crushing . . . snaps rope back to its original shape and diameter.

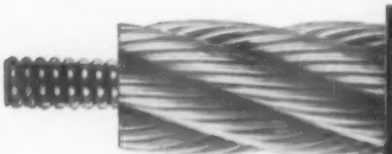
COMPLETE LUBRICATION
SpringKore's hollow center acts as a lubricant reservoir . . . reduces corrosion and friction wear by assuring lubrication of innermost parts of rope.

MORE SUPPORTING CONTACT POINTS
The coiled shape of the spring center gives the strands of the rope more supporting points . . . reduces friction by spreading pressure evenly over many contact points.

UNIFORM DIAMETER
The firm internal support provided by the spring center maintains uniform rope diameter . . . reduces wear caused by outer strands rubbing against each other.

LESS INSIDE STRAND WEAR
The spring center flexes under crushing instead of scoring strands . . . reduces wear on inside wires.

Put these SpringKore advantages to work on your rotary drilling rigs. Specify J&L SpringKore Rotary Drilling Lines. Available in standard sizes and construction.



J&L STEEL

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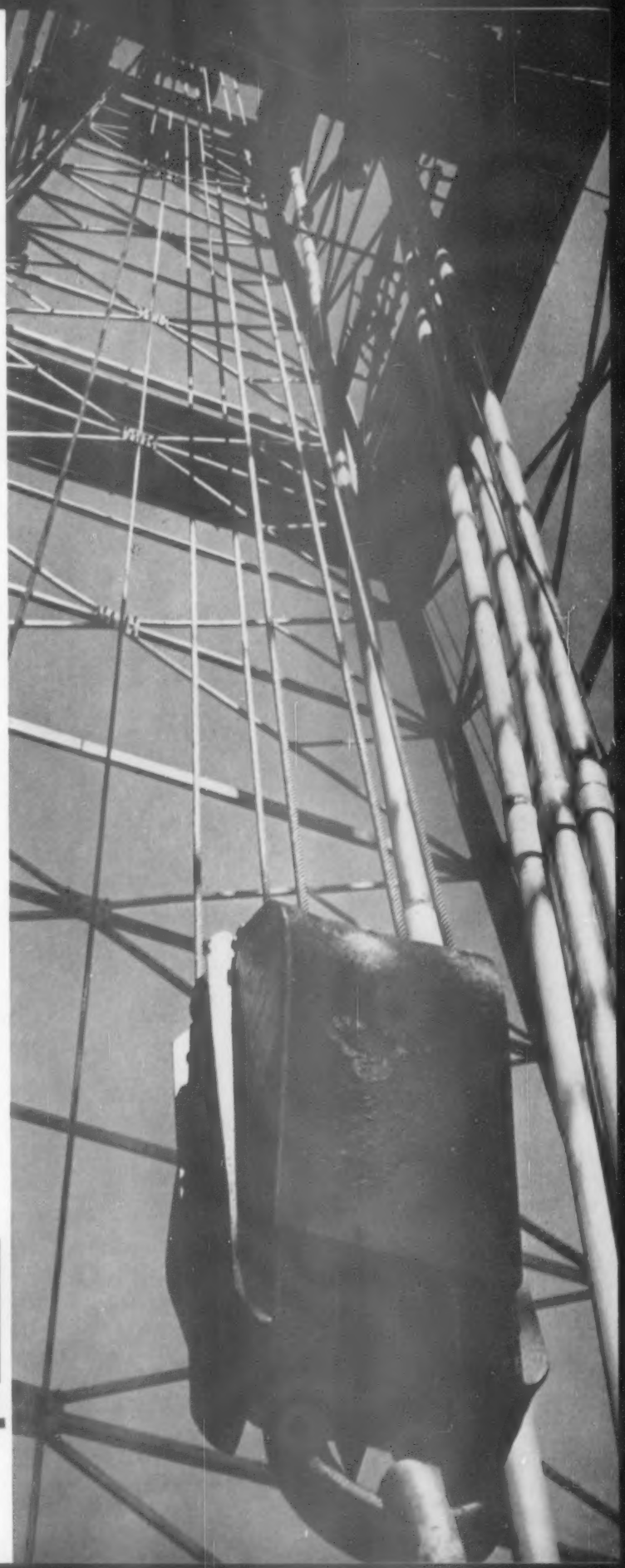

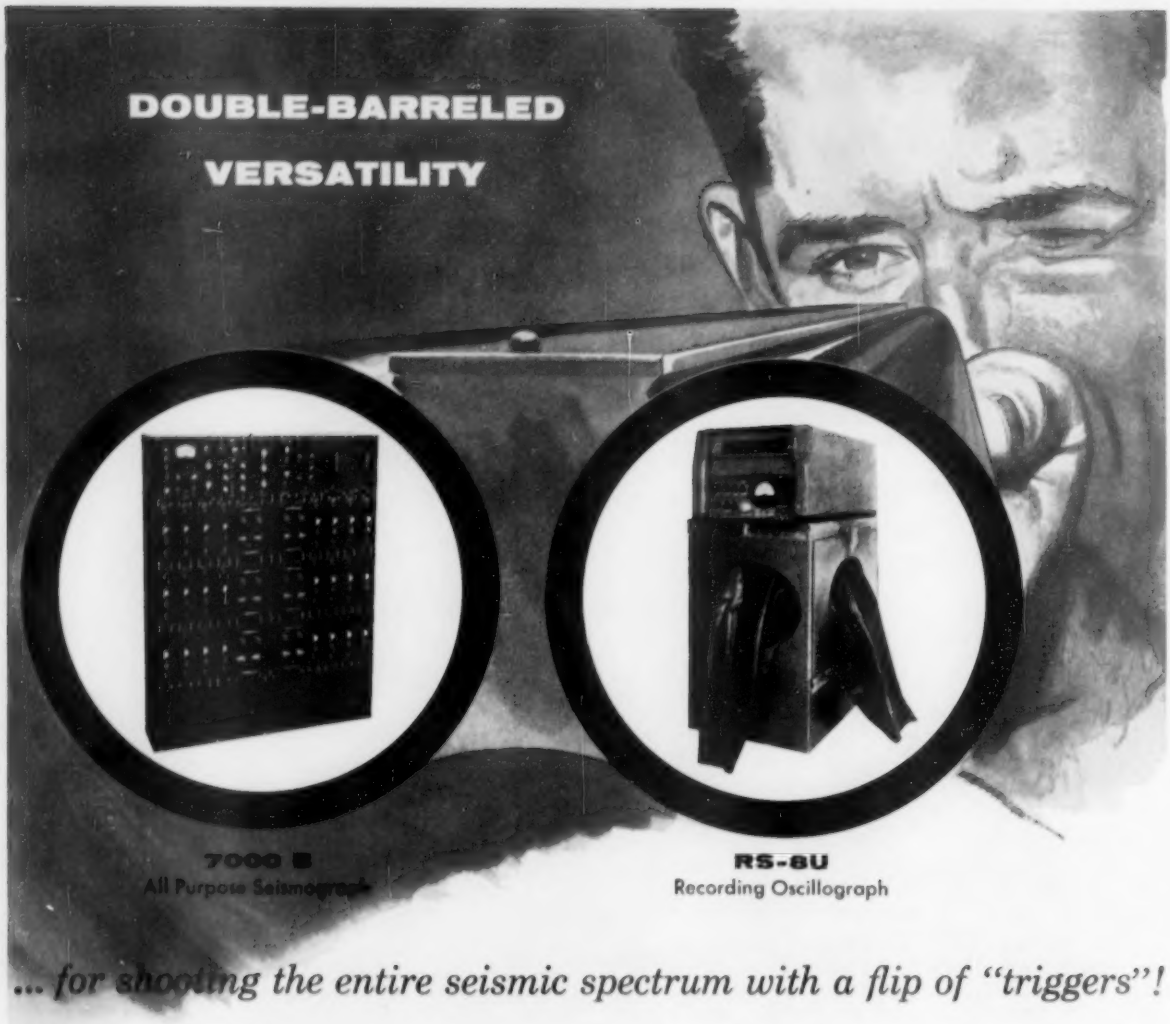

... for shooting the entire seismic spectrum with a flip of "triggers"!

Now, with *one* seismic system (instead of three), Houston Technical Laboratories makes it possible for you to exploit every seismic method to the fullest extent.

The versatile 7000 B "All Purpose" Seismograph places the entire seismic spectrum (5-500 cps) at your fingertips . . . High Resolution Reflection Recording, Conventional Reflection Recording, and Very Low Frequency Refraction Recording. Three AGC speeds and 2975 useful filter combinations assure you of optimum instrumental control of every recording technique. The equally adaptable RS-8U Recording Oscillograph permits instantaneous change of paper speeds for the three seismic recording methods, while maintaining the highest recording accuracy and photographic quality.

Available in *portable* as well as console units, the 7000 B and RS-8U fulfill every exacting requirement for direct seismic recording. Further, their operational latitude makes these units perfect for use in magnetic operations—either field recorder and playback system, or in an office analysis system.

Write for respective bulletins—
S-309 for the 7000 B, and S-313 for the RS-8U.

HTL

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*Trademark registration applied for.

DU PONT

PETROLEUM CHEMICALS DIVISION

NEWS

DU PONT

October ★ One of a Series of Bulletins for the Petroleum Industry ★ 1956

Merchandising Opportunities in Improved Oils

With the "super premium" gasolines so much in the news, there's an especially good marketing opportunity for premium motor oils.

Consider, for example, an oil with low-duty detergency for stop-and-go driving. The majority of American passenger-car driving consists of trips shorter than 10 miles. And more than 90% of all city bus, taxi and delivery truck operation is in stop-and-go city traffic. These low-power, low-temperature operating conditions, of course, are likely to result in excessive build-ups of engine sludge. This means that there is a considerable market for a new type of lube oil with low-duty detergency.

New polymeric additives

To give oil this property, Du Pont has developed two synthetic detergents... Lube Oil Additives 564 and 565. Both are ashless polymeric additives, slightly basic, that provide an economical and effective means of preventing engine oil sludge – particularly under low-duty, stop-and-go driving conditions. And these additives are effective V.I. improvers as well as detergents.

Any of our sales offices will gladly supply additional information, and a suggested promotion kit.

Additives prevent many oil-burner troubles

With the heating season just getting under way, many old familiar oil-furnace problems will be back to cut, unnecessarily, into fuel distributors' profits through another season.

Plugged nozzles, screens and filters; gel-clogged lines; ignition and stack control failures may all have been part of a day's work for distributors and servicemen last year. But this year can tell a different story. Here it is . . .

When heating-oil is sold on a service-contract basis, every service call costs the supplier money, obviously. This of course comes out of profits. Fortunately, however, many of these common headaches can be prevented with minute quantities of low-cost Du Pont additives.

To prevent sludge . . .

Du Pont Fuel Oil Additive No. 2 (FOA-2) is a double-action additive that works effectively both as a dispersant and as a stabilizer.

It minimizes the formation of insoluble residues. It also helps to rid dirty systems of sludge deposits previously accumulated, by reducing the size of the sludge particles so finely that they do not clog screens or nozzles. In this way, it can actually help reduce the man hours required for distributors' service calls.

Why many railroads prefer economy fuels stabilized with Du Pont FOA-2

Fuel specialists and purchasing agents of many railroads are taking a keen interest in the use of Du Pont Fuel Oil Additive No. 2 (FOA-2) for stabilizing all their economy grade diesel fuels.

Uniform results in a variety of different fuel stocks are a big reason.

Since diesel fuels—especially economy grades – vary widely in their response to additive treatment, you can readily see why such uniformity is an important advantage to the railroads which often have a number of different suppliers loading into the same tank.

After carefully testing economy fuels with a number of different additives for several years, it has been found that FOA-2 gives good results over the widest range of varying fuel stocks. Because of its outstanding stabilizing and dispersant action, FOA-2 helps to cut maintenance costs by relieving filter-plugging and injector-sticking problems. Moreover, the additive does not contribute to the sparking problem which may accompany the use of economy diesel fuels.

If you would like more detailed information about on-the-railroad results obtained with FOA-2, just get in touch with one of our representatives.

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OVER

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED *Heating Troubles*

To keep electrodes and stock controls clean . . .

As distributors well know, a number of burner failures are due to insulating deposits on the stack controls and ignition electrodes. Because FOA-2 is a nonmetallic, *ashless* additive, it leaves no deposit to insulate electrodes . . . or to interfere with the operation of control mechanisms.

Du Pont FOA-2 helps prevent nozzle plugging

To prevent gel-clogged lines

Du Pont Metal Deactivator (DMD) can be used effectively to prevent *copper* fuel lines and filter screens from playing mischief with the chemical composition of heating oils. When unchecked, the copper is likely to cause the formation of a gelatinous substance . . . and complete stoppage of fuel flow.

DMD can be economically used in combination with FOA-2. When the two additives are combined, the DMD frequently carries part of the stabilizing load—thus reducing the amount of FOA-2 that is needed for sludge prevention.

For best results

FOA-2 and DMD should be added to freshly prepared stocks at the refinery. For more detailed information on the use and performance of these additives, just get in touch with one of our representatives at any of the sales offices listed below.

ASSISTANT DIRECTOR IN CHARGE OF PRODUCT EVALUATION

Dr. Robert H. Blaker joined the Du Pont Petroleum Laboratory in 1953 as research supervisor, became head of the Combustion Division in 1954 and was appointed assistant director in charge of product evaluation in February of 1956.

Dr. Blaker joined Du Pont in 1950 as research chemist at Jackson Laboratory, where he also served in the Petroleum Division, after an initial assignment in synthetic fiber dyeing.

Berea College awarded Dr. Blaker an A.B. degree in chemistry in 1942. He also attended M.I.T. and received his Ph.D. in physical chemistry at California Institute of Technology in 1949. Dr. Blaker also studied in Britain under an Imperial Chemical Industries grant.

He is a member of the Society of Automotive Engineers and the Petroleum Division of the American Chemical Society.

DR. ROBERT H. BLAKER

New findings on fuel performance in high-compression engines

How much will compression-ratio increases boost octane requirements?

Not necessarily as much as has been generally thought—according to the results of recent studies at the Du Pont Petroleum Laboratory.

Our tests showed that the engine-design, fuel and lubricant, *all* have a significant bearing on engine-performance. This indicates that octane requirements of high-compression engines can be kept at a minimum by careful attention to *each* of these three factors.

A surprising development was noted in one car operated at an 11:1 C.R. Running under normal conditions, this car was found to be free of combustion noise, even on a 100 octane fuel.

It was found that the 90% distilled point is not necessarily the criterion for measuring deposit-harm of fuels. This can mean that there will be more latitude in blending the components for high-compression fuels; more heavy ends may be used in this type of fuel, without detrimental effects on the engines.

The tests also indicate that octane requirements of high-compression engines can be reduced by improvements in lubricants and through engine design.

A paper with full details on this testing program was recently presented at the API Refining Meeting in Montreal. Just drop us a line if you would like a copy.

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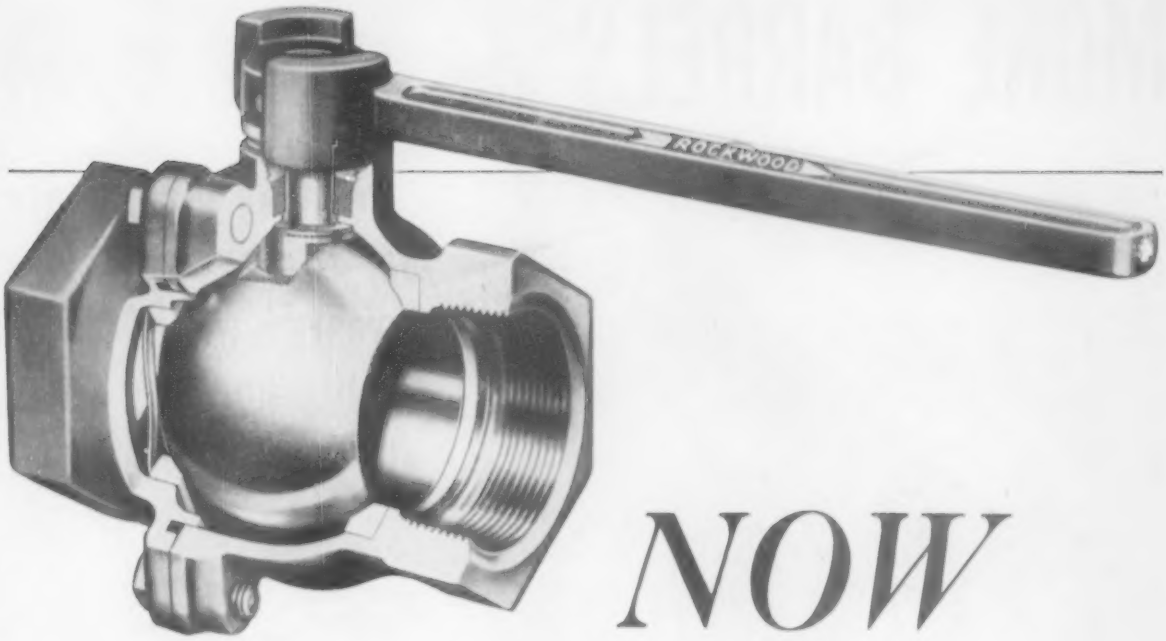

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a new STEAM valve with all the Rockwood Ball Valve advantages!

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It Handles up to 125 Pounds of Steam per square inch and 350°F, with ease.

It's Leakproof — even after continued use Rockwood Steam Ball Valves stay dry.

It Opens and Closes Quickly — only a quarter turn is needed to open or close Rockwood Ball Valves.

It Has Longer Wear-Resistance — chrome-plated bronze ball withstands abrasion, scratching and pitting.

Rockwood's new Ball Valve for use with steam comes in pipe sizes from ¾" up to 2". Send coupon for full information and data. Distributors in all principal industrial areas.

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FULL, ROUND FLOW

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Designed for top production performance round-the-clock, month after month, Cabot quality pumping units are unmatched when it comes to cost of operation—and, barrels of oil pumped. Adjustable crank or beam-balanced types available in a size to meet your need. ***See your J & L Supply man.***

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ON THE SPOT FIELD SERVICE

Cabot now offers its OWN 24-HOUR PARTS AND MAINTENANCE SHOPS at Odessa, Houston, Alice, Kilgore, Compton, Great Bend, Seminole, Casper, Pampa and Tulsa.

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CABOT
SHOPS, INC.
PAMPA, TEXAS
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Rx Making sick wells . . . WELL!

First comes diagnosis. Before the cure the trouble must be known so that proper treatment may be prescribed.

Trained Layne research men, with the help of the latest and best in scientific equipment, find the trouble . . . determine the corrective measures . . . and experts go to work.

Successful? . . . One smaller Southern city saved the cost of a new well at a nominal cost. And that's just one success in a long line of sick wells that have been made well by Layne.

The nearest Layne associate company will be glad to discuss such problems with you—without obligation. It's another Layne service that proves it's always wise first to "ASK THE MAN FROM LAYNE" on any phase of water development or maintenance.

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MEMPHIS
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Layne

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SHELL CHEMICAL INSTALLATION

❶ **CONSTANT MOTION** due to temperature variations occurs in the pipe lines for water cooling a Freon refrigeration unit at Shell Chemical in Torrance, California.

❷ Three-span Sola-Flex bellows take the lateral movement of the main piping system in offset. Tie bars prevent end thrust normally caused by the internal pressure.

❸ With all stresses safely absorbed by Sola-Flex joints, pipe connections to the cooling tank are in balance and trouble-free service life is assured for all elements of the piping system.

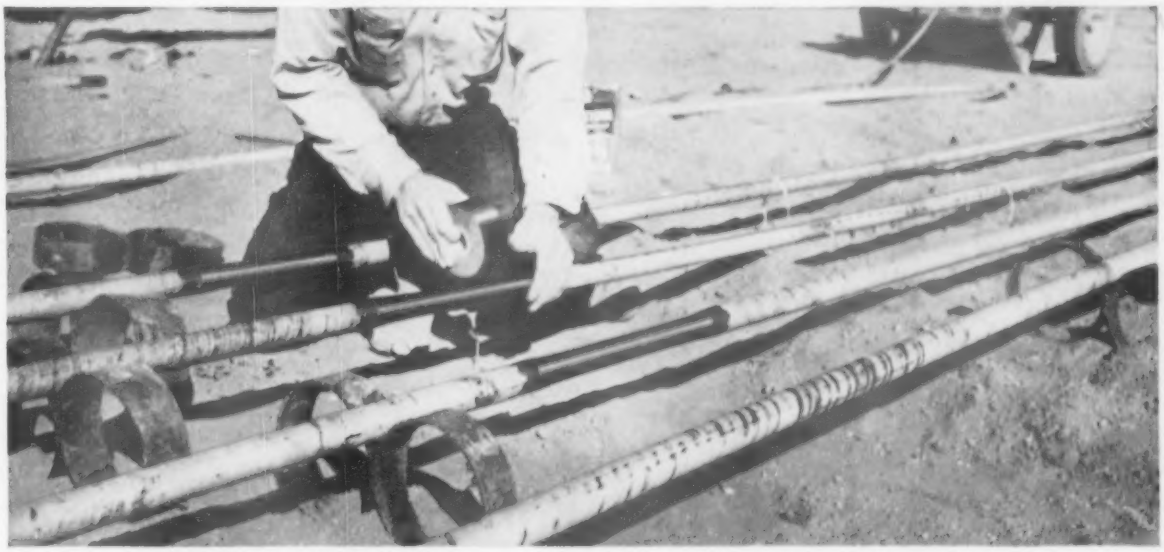
Sola-Flex bellows have many uses in chemical installations. They are custom-engineered in any size, shape or configuration required. Stock items in all standard pipe sizes are also available. Send for a catalog of rugged, economical Sola-Flex joints. Dept. C-84, Solar Aircraft Co., San Diego 12, Calif.

SOLAR
AIRCRAFT COMPANY
SAN DIEGO DES MOINES

Designers, Developers and Manufacturers • Gas Turbines • Aircraft and Missile Components • Bellows • Controls • Coatings • Metal Alloy Products

Polyken coating used exclusively on these welded joints

Why the Albuquerque branch of Southern Union Gas uses only Polyken "Controlled Strength" coating



Quick work . . . lasting protection. Southern Union Gas crewman wraps welded joints in the field with *Polyken* Polyethylene Tape No. 900.

***Polyken* Tape** fills the prescription here for the Southern Union Gas Company. The installation: service lines carrying natural gas to a development of new homes.

Mill-coated pipe is welded and the joint hand wrapped on the site. This method is far faster and cheaper than former methods.

Further advantages of *Polyken* Polyethylene Tape: easy to handle; compact in transportation and storage; simply applied; tough, durable, fast-sticking and secure; just the right stretch to conform to joints and caps. (That's what we mean by "Controlled Strength": the right combination of backing and adhesive to give you "all work—no waste".)

Want to figure application costs on your job? Let's sit down and work them out. Write, wire or phone today: The Kendall Company, *Polyken* Sales Division, Dept. OG-J, 309 W. Jackson Blvd., Chicago 6, Illinois (RAndolph 6-4250).

Complete catalog, Sweet's Industrial Construction File, Sec. 8c/Ke

Polyken®

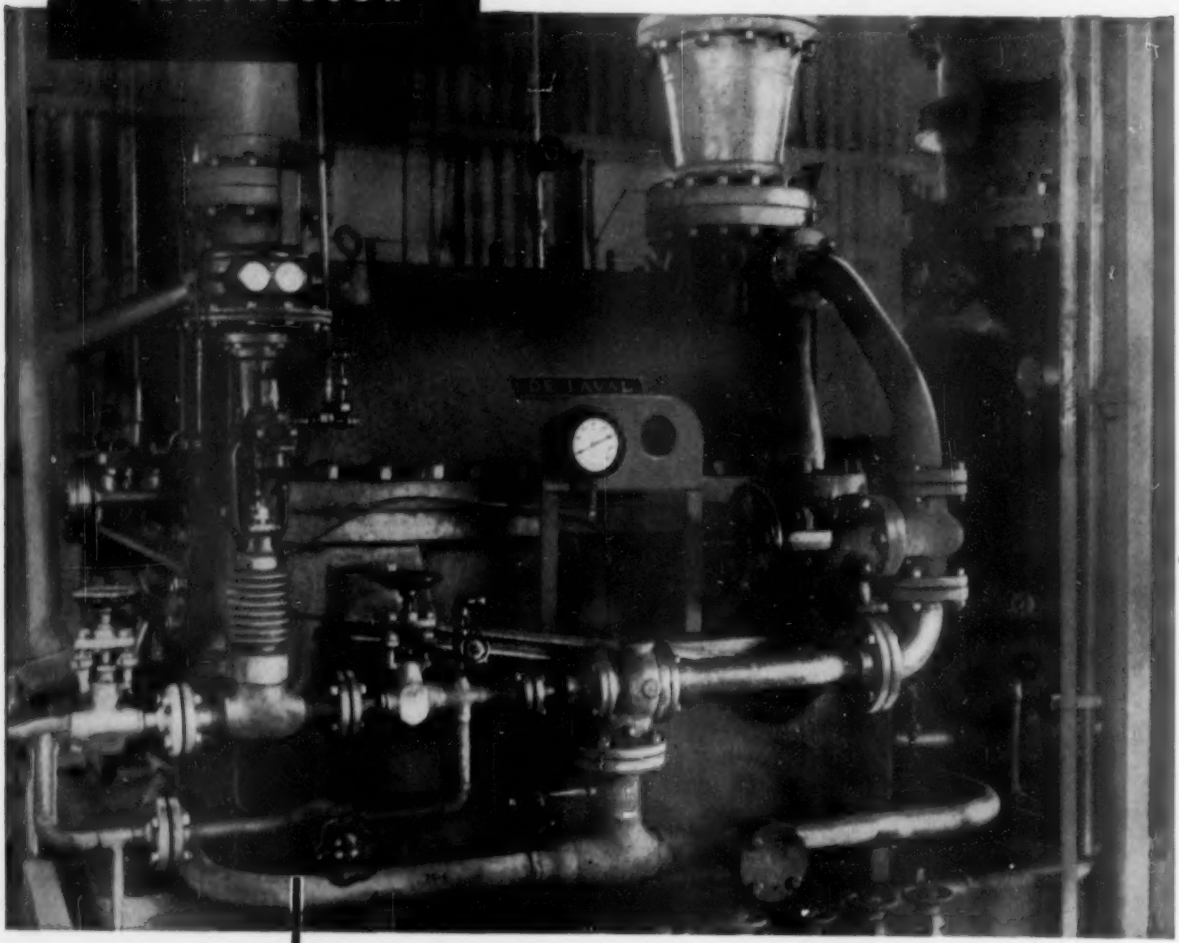
CONTROLLED STRENGTH

PROTECTIVE COATINGS

THE KENDALL COMPANY, POLYKEN SALES DIVISION

DE LAVAL
CENTRIFUGAL COMPRESSOR

handles hydrocarbon gas in Sunray Oil refinery



Send for new Bulletin 0504

This De Laval 7-stage centrifugal gas compressor, installed at the Duncan, Oklahoma refinery of the Sunray Oil Company, handles a heavy hydrocarbon gas in a delayed coking process. The gas has a molecular weight of 31.5.

The De Laval centrifugal compressor is rated at 2840 inlet cfm; discharge pressure is 240 psia. The power required is 1350 bhp with compressor operating at 9900 rpm.

Sunray Oil is another refinery which has selected De Laval compressors for heavy-duty continuous service. Rugged, horizontally split casings, individually designed impellers, perfectly balanced rotors and externally mounted, cylindrically seated bearings are design features that assure optimum performance and long service.

DE LAVAL *Centrifugal Blowers*

DE LAVAL STEAM TURBINE COMPANY
310 Nottingham Way, Trenton 2, New Jersey

DL 317

PUMP PROBLEMS?

Another well is about ready for the pump. Your allowable is good, so you have in mind an Axelson Sure-Seal. Perhaps the Traveling Barrel Type; perhaps the Rod Type with Stationary Barrel.

Hardened cast iron sectional plungers? Stainless steel? Not likely, but you'll think about it.

In the meantime you'll discuss this with J&L Supply. J&L has the shop, the parts and the know-how to alter a standard Axelson pump to fit the peculiarities of a well.

It's a comfortable feeling . . . this knowledge that J&L Supply can provide the really efficient pump for any well of any depth and characteristics.

Get your J&L store on the phone NOW.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

18-G

The world's deepest well...

J-M Wildcat® slush pump packing helps Richardson and Bass Rig #25 set new depth record

Cutaway shows how Wildcat rings provide tight sealing with low friction.

PASSING the previous world record of 21,482 feet and drilled to a total depth of 22,570 feet, Richardson and Bass Rig 25 has now drilled what is acclaimed as the world's deepest well in search of oil and gas. Contributing to this record-breaking operation as standard packing for the two slush pumps is Johns-Manville's Wildcat Packing.

This new packing has proved itself more than equal to the unusually severe conditions on this rig. Pumps operate at a pressure of 2700 psi at approximately 35 strokes per minute. 12 hours are required for complete recirculation of the mud which has a high density of 18 lb. and a pH greater than 12.

The Richardson and Bass drilling team reports that Wildcat has kept their slush pumps working far longer than is possible with old-style slush pump packing, virtually eliminated rod scoring and reduced packing replacement to the absolute minimum. On the rare occasions when repacking is necessary, Wildcat's ease of installation greatly speeds this operation . . . cutting costly down time.

Developed especially for slush pumps

Engineered for its job, Wildcat provides highly effective sealing of bore and rod surfaces. It can be made in sizes for all slush pump stuffing boxes. See it at your field store. Look for countercard display with actual sample attached. Or write Johns-Manville, Box 14, New York 16, N.Y. In Canada, Port Credit, Ontario.

On November 9, 1955 a new record depth was established when Richardson and Bass Rig 25 passed 21,482 feet in the Mississippi delta marshes, 40 miles southeast of New Orleans. Drilling superintendent is W. H. Spurlin, Tool Pusher is G. G. Jordan.

Derrick man Lanis J. Breaux installs Wildcat Packing on the Ideal (National Supply Company) S-935 pump.

This well is a joint venture between Richardson & Bass, John W. Mecom and Freeport Sulphur Company.

Johns-Manville PACKINGS & GASKETS

From sizzling to sub-zero temperatures in seconds...

needed, a lubricant that could take it!

A PROBLEM simple enough to state — seemed impossible to solve: a revved-up jet on the tropical atoll runway ready to take off. That's a hot combination. As the jet zooms up into the stratosphere, air temperature plummets down — far and fast. In seconds it has changed as much as three hundred degrees. No then-existing lubricant could stand the gaff. Needed — *a new kind of lubricant.*

This is what Texaco did about it...

developed and tested several hundred different lubricants . . . came up with the answer . . . *one* lubricant that functioned perfectly throughout terrific temperature change.

This is just one more example of a tough problem in product development solved in the *Texaco Research Centers.*

THE TEXAS COMPANY

Texaco Research—
always ahead

TEXACO

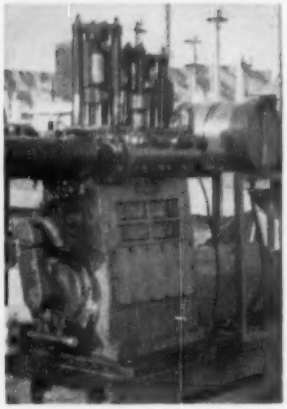
"It'll pay us to replace it with an ALDRICH PUMP!"

Downtime, due to pump failure, is always a costly item. It takes the reliability and freedom from maintenance found in an Aldrich Pump to eliminate downtime under continuous, heavy duty pumping operations. Top performance under these conditions has earned Aldrich its reputation for building pumps of highest quality and dependability.

The tougher the job . . . the more important it becomes to take advantage of our wide experience in providing the petroleum industry with pumps for water flood, pipeline, gasoline plant, hydrocarbon injection or petrochemical service.

In the less critical jobs, too . . . it makes sense to call Aldrich. The simplicity of the Aldrich Direct Flow design, with fluid-end sectionalization, offers substantial economies in both operation and maintenance.

A copy of our new condensed catalog, showing the line of Aldrich Pumps is yours for the asking. Write for Data Sheet 100. The Aldrich Pump Company, 9 Gordon Street, Allentown, Pa.



Shown above is one of a number of Aldrich 5" stroke, Triplex Pumps installed at a major west coast water injection project. These pumps are currently handling 35,000 bbl daily at injection pressures of 1,000 psi.

THE ALDRICH PUMP COMPANY

Pittsburgh offers you the skill and knowledge of its

415 Finishes Technologists

● **Pittsburgh Plate Glass Company's** new Paint Research Center at Springdale, Pa., contains the most modern laboratories devoted exclusively to the creation and experimental production of new finishes.

● **A necessary part** of research and development is the formulation of new chemical vehicles to improve adhesion and durability of finishes for the petroleum industry.

to develop for you more durable anti-corrosive coatings for structures and facilities and more efficient ways to apply them . . . without adding to your payroll.

Now you can get tailored-for-you finishes for oil and gasoline storage tanks that give greater protection against the destructive effects of corrosion and weather. Pittsburgh places at your disposal the most modern laboratories for fundamental and applied research in the paint industry.

● **In its modern** Paint Research Center at Springdale, Pa., and the development departments of its 11 paint plants, Pittsburgh maintains a staff of 415 highly trained chemists, engineers and technicians. The creative work of this group is supported in a practical way by an experienced field sales and service staff.

● **From this group** have come many important developments in finishes for the petroleum industry. Among these is Pittsburgh's brilliant synthetic white TANKHIDE Double Cover. This is a combination of intensely white controlled-chalking titanium pigments and weather-resistant vehicles. One spray coat of TANKHIDE Double Cover produces the same film thickness as two coats of conventional synthetic white finish. This results in labor savings up to 25% as reported by painting contractors.

● **TANKHIDE'S** gleaming whiteness is maintained throughout its life by self-cleaning action. Besides brilliant white, TANKHIDE is also available in colors.

● **Bring your refinishing problems to us.** You can have the benefit of the creative ability of our technologists to help you develop superior coatings for your structures and facilities, without adding to your payroll. Pittsburgh Plate Glass Company, Industrial Finishes Division, 1 Gateway Center, Pittsburgh, Pa.

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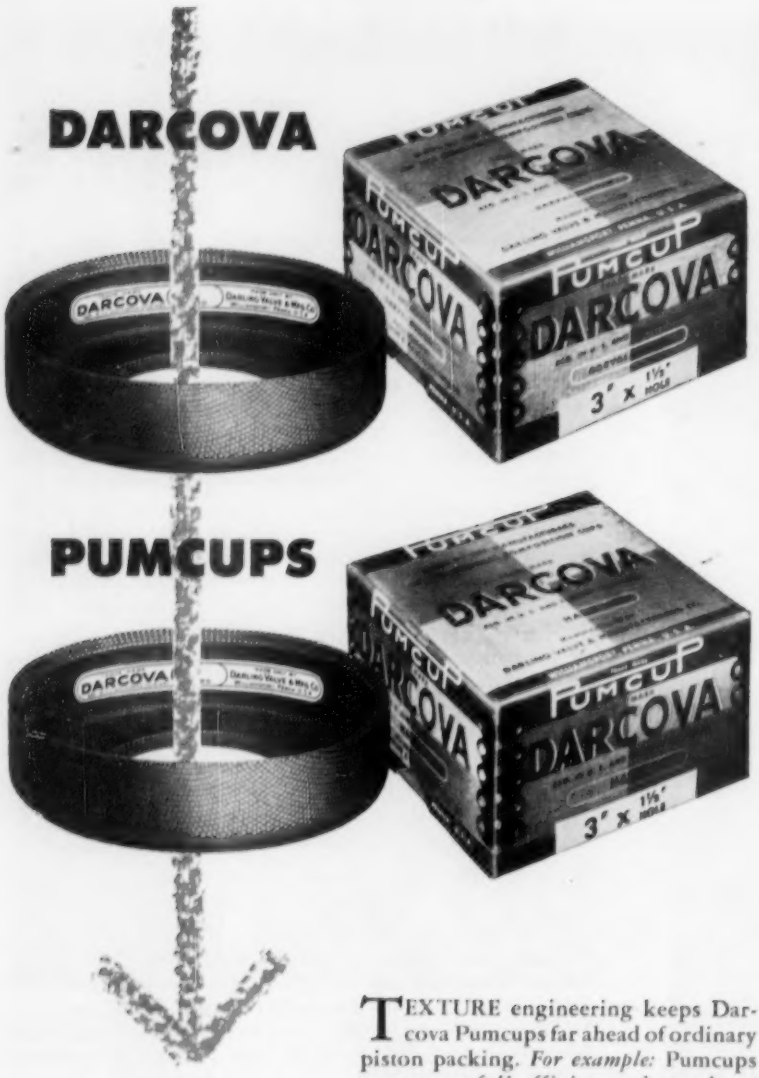
● **Accelerated weathering** tests provide preliminary data quickly on the rate of fading and chalking, permitting reasonable accuracy in forecasting length of actual service.

● **Many types of special** Pittsburgh finishes have been used with uniform success on structures and facilities of all kinds by leading oil and gas companies in all parts of the world.



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- PUMPING EFFICIENCY
- LOWER COST
- LONGER SERVICE

TEXTURE engineering keeps Darcova Pumcups far ahead of ordinary piston packing. *For example:* Pumcups operate at full efficiency throughout their entire life. Fluid slippage is virtually eliminated.

Moreover, you can count on much longer service . . . users report Darcova Pumcups outlast other packing at least 3 to 1!

Write for all the facts on Darcova efficiency: Bulletin No. 4502 on Pumcups for air and hydraulic mechanisms; No. 4401 on Pumcups for reciprocating pumps.

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP

PUMCUPS

They Say—

Are Engineers Deserting?

Dear Sir:

A gentleman in Pittsburgh, Samuel Schiffer, has called to our attention an article which appeared in the July 2, 1956, issue of The Oil and Gas Journal. He raised the question as to whether or not it was true that 83 per cent of our engineering and science graduates have departed their fields.

In the March issue of the Carnegie Alumnus there is an article which deals with our recent alumni survey. It is difficult to say how many of our alumni have departed their fields, but certainly 83 per cent is much in excess.

If people have titles other than "engineer" it does not necessarily mean that they are not following the fields for which they were trained . . . A professor or metallurgist or project engineer or physicist certainly has not strayed from the area of his training . . . If a man becomes a president or other high executive officer in a company which deals in the engineering or scientific fields, it would be our opinion that he very definitely is following his field of training . . .

John G. Johnson
Associate Secretary
Alumni Federation
Carnegie Institute of Technology

Reader Takes Exception!

Dear Sir:

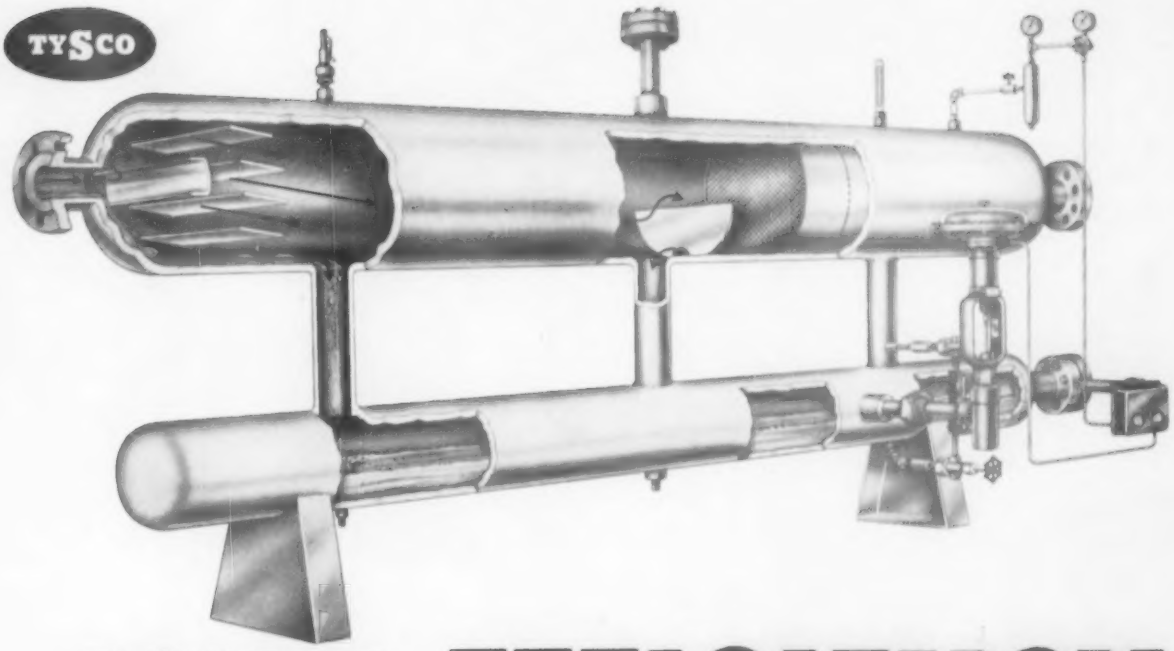
There are many helpful and encouraging statements in the Kogbetliantz article ("Electronic Computers Aid Geophysical Interpreters," by Dr. E. G. Kogbetliantz, The Oil and Gas Journal, August 13, page 136) with regard to the speed of performing routine operations on geophysical data of potential fields.

However, the speed or rate of computation does not increase nor decrease the efficacy of such operations so the article must not be construed to be concerned with the fundamentals of interpretation.

The paragraph on aeromagnetic interpretation was most misleading and this letter is primarily written to halt the perpetuity of such ideas. The author advocates an interpretational procedure devised by Baranov which in essence requires the transformation of the total vector of the observed aeromagnetic field to the vertical component.

The transform is employed by Baranov to allow the use of conventional

TYSCO



DOUBLE BARREL EFFICIENCY

with TYSCO'S *Horizontal Separator*

Tysco horizontal separators offer the producer several outstanding advantages where high performance, heavy-duty equipment is required. The twin-chamber design provides almost perfect equilibrium between gas and oil, with the upper chamber drying the gas and the lower one degassing the bulk fluid in the stream.

Tysco supplies horizontal separators in a wide range of capacities and working pressures. All piping and control equipment is easily accessible, and the horizontal design permits mounting of two units on a single skid for moving stage-separation combinations.

Ask for complete specifications on the Tysco horizontal separators before making your next installation!

TYSON SMITH COMPANY

one of the SMITH INDUSTRIES *Serving the Southwest*

8000 HEMPSTEAD HWY. HOUSTON 8, TEXAS

NEW WAY to save good money that's "going up in smoke"

***PERMAGLAS*® SMOKESTACKS** of glass-protected steel answer one of industry's chronic, money-draining problems.

SMOKESTACKS A PROBLEM? Certainly! And a costly one, too. Conventional, unlined steel stacks readily *give in* to the acid condensates in smoke — requiring frequent repair, periodic replacement as in the photograph above.

WHAT A DIFFERENCE with A. O. Smith *Permaglas* stacks! Acid-resistant glass coating prevents corrosion . . . permits use of lighter steel for easier handling, less costly foundations. (Note stack sections at left.)

WANT MORE FACTS about *Permaglas* smokestacks from the world's largest manufacturer of glass-protected steel products? Write for free literature on any A. O. Smith product shown in the panel to the right. ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ☛

Through research ... *a better way*

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to make steel work for you!

A.O.Smith
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For facts about any of the products shown here — write A. O. Smith Corp., Milwaukee 1, Wisconsin

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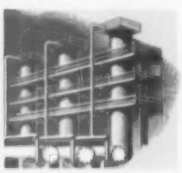
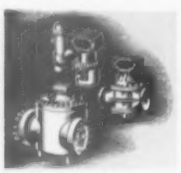
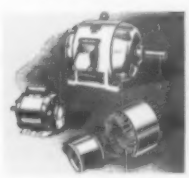
Permaglas and Burkay water heaters

Harvestores for the farm Permaglas Storage Units for industry


Pressure vessels, heat exchangers

Line pipe, oil well casing


Liquid meters, gasoline dispensers


Electric motors

Welding machines, electrodes, accessories

Permaglas smoke stacks

Glass-lined and stainless tanks

Automotive frames and parts

Glascote processing equipment

methods of interpreting gravity data. Two very elementary faults are immediately evident:

. . . The high precision and . . . the great advantage of a continuous record are partially destroyed by the transformation, regardless of how it is done, IBM or otherwise. When one is conscious of the skill and effort spent in the creation of the airborne magnetometer, one is appalled to find its results mishandled because Baranov works with the vertical component only.

. . . There is no need for, and many reasons against, interpreting magnetic data by gravitational methods. The origin of many gravity anomalies is completely different and unrelated to that of magnetic anomalies. This . . . causes gravity maps, and the interpretation thereof, to be relatively very complicated. Rapid and easy methods of interpretation are available for the relatively simple magnetic problem.

One small and annoying error exists in the paragraph on magnetics. Kogbetliantz repeatedly used "distortion" when he means "displacement." Distortion or displacement, his remarks thereon are simply untrue.

For example, he states that the "connection between it (i.e., magnetic anomaly) and the geological feature creating this anomaly does not appear on the map." In view of the very existence of the anomaly, this statement is a strange agglomeration of words!

Nelson C. Steenland
Gravity Meter Exploration Co.
Houston.

Author Defends Position

Dear Sir:

The letter of Mr. N. C. Steenland concerning my article contains so many errors and misinterpretations that I feel obliged to restate things as they are.

1. Dr. Baranov's transformation does not yield the vertical component of the observed anomaly.

2. Mr. Steenland does not seem to understand that this method transforms not only the anomalies but also the normal Earth's field.

3. The result of this transformation is not at all a gravimetric anomaly. It is why it is called "pseudo-gravimetric."

4. Its interpretation is as simple and easy as that of a purely magnetic anomaly induced by a vertical normal Earth's field.

5. In his conference Dr. Baranov did not propose to stop using continuous records: he only gave the mathematical foundations of a new method.

6. Neither did I in my article. Naturally, the continuous records should be studied in any case and the transformed map facilitates this study al-

ON REFINERY FUEL GAS SERVICE AND MANY OTHER PETROLEUM APPLICATIONS

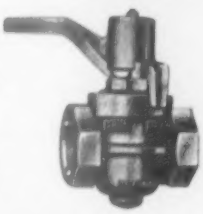
DeZURIK
PLUG VALVES

offer so many advantages on critical petroleum services. They open easily . . . just a quarter-turn of the lever. And they DON'T LEAK on gas or liquid services.

EXCLUSIVE
ECCENTRIC ACTION

accounts for the remarkable performance of DeZurik Valves. The eccentric-shaped, resilient-faced plug swings shut without friction . . . closes on the eccentric-raised seat, sealing tight despite scale, dirt or other solids in the line.

IN THE FIELD, OR IN THE REFINERY, DeZURIK VALVES reduce maintenance, increase efficiency! Write for details. Representatives in all principal cities.



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SHOWER COMPANY
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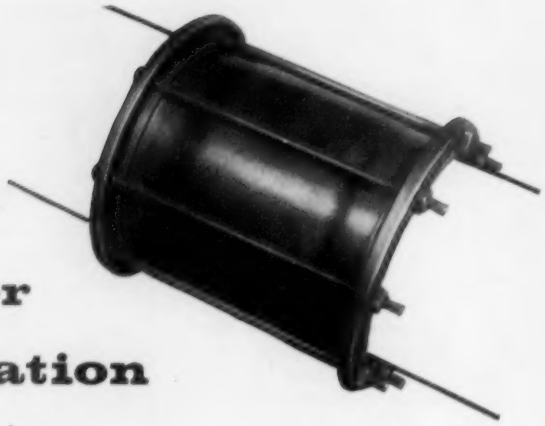

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installation
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THE DRESSER WAY!

You'll find plenty of uses for Dresser Couplings and Long Sleeves around a drilling rig . . . or anywhere else you join pipe.

That's because Dresser Long Sleeves make pipe joining so quick and easy. Pipe threading is eliminated. You simply slip on the sleeve and tighten with a wrench. Perfect alignment of pipe sections is unnecessary because the specially compounded rubber gasket permits up to 4° deflection at joints.

You get a permanent, bottle-tight connection every time—one that has the "give and take" necessary to absorb vibration, settlement and other stresses.

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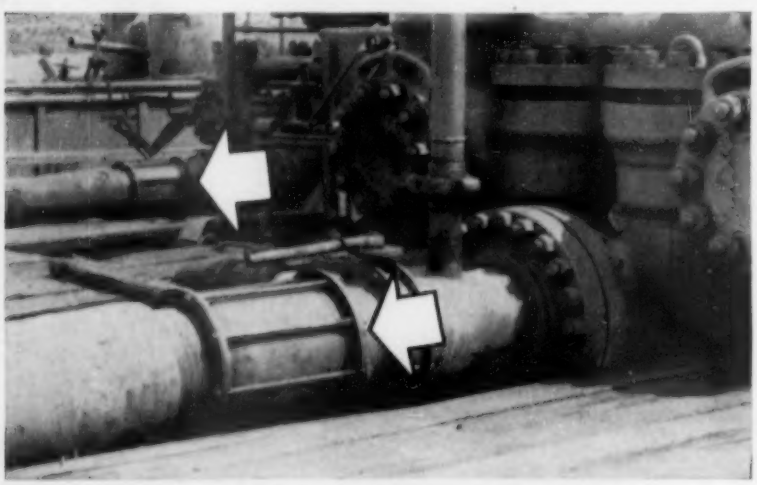

AVAILABLE AT ALL LEADING OILFIELD SUPPLY STORES IN THE UNITED STATES AND CANADA

Style 38 Coupling

Style 40 Long Sleeve

Hydrepair® Asbestos Cement Pipe Clamp

Style 63 Expansion Joint

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lowing the choice of meaningful profiles.

The very end of Mr. Steenland's letter is an excellent example of what should never be done in a discussion.

E. G. Kogbetliantz
International Business Machines Corp.

Tough Sledding for Oil Substitutes

Dear Sir:

I have just finished reading your editorial in the September 17 issue on the tough competition with which oil's substitutes are faced.

I don't know that I have ever seen our position in the competitive field so well stated as you have done in only one short page. It had the effect of making me feel a lot better as to the future of the oil business and, in addition, it brought to mind very forcibly what taxes do to the price of our products.

I am sure that people, both in oil and out, are inclined to lose sight of how much money is raised in taxes through the medium of oil and its products, and are always inclined to think that the refiner pockets a much larger portion of the price for a gallon of gas or a quart of oil than is actually the case.

I would like to see your editorial given a lot of publicity and for this reason am sending a copy of this letter to I.P.A.A. and to our Kansas Independent Oil and Gas Association, with the hope that they will be able to help in this regard.

A. J. Boundy
President
Kiowa Drilling Co., Inc.
Wichita, Kans.

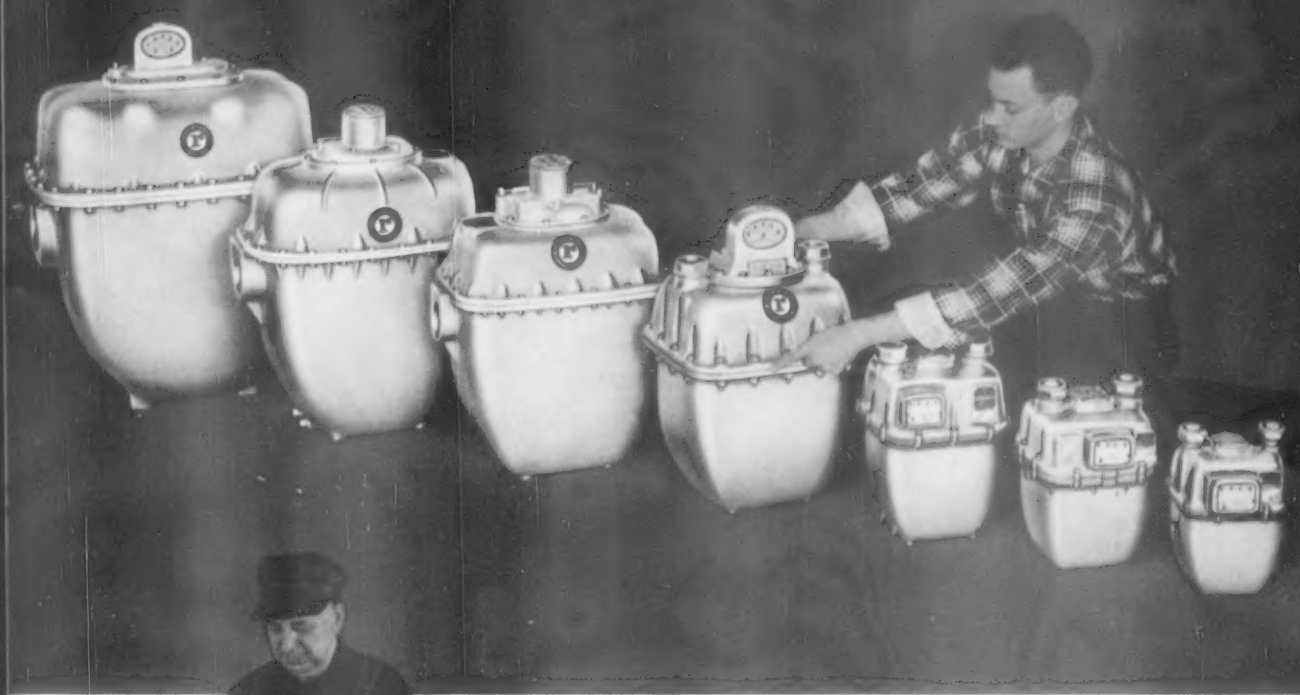
Needed: A Long Look at P.R.

What is wrong with oil country publicity? Too many people believe that the Texas oil "billionaires" are unscrupulous exploiters of the public. Somewhere along the line public-relations men have failed to get down to "grass roots" and let people know the facts. Perhaps the job is too tough. The unfortunate affair of the Superior Oil Co. and Senator Case, along with the most recent Standard of Indiana telegrams to Senator Thye of Minnesota, keep the situation agitated.

Just how to approach the problem is something that no one has yet solved, but one approach at least would be to secure public-relations men who have been practical oil men before entering public-relations work, men who know about what they are talking or writing and not just how to prepare publicity blurbs. The oil journals do good work, but they reach the professional oil men, not the public . . .

Public relations are better now than

They're All ROCKWELL *Single Joint* Gas Meters...



Cost Less to Maintain

Just break the main joint at the cover casting and lift the entire measuring assembly from the bowl type body. Replace the old unit with either a new or rebuilt duplicate and the meter is ready for another period of extended service. A screw driver is the only tool needed to make this switch. Write for full details.

Only one main gasketed joint to seal — easiest to service

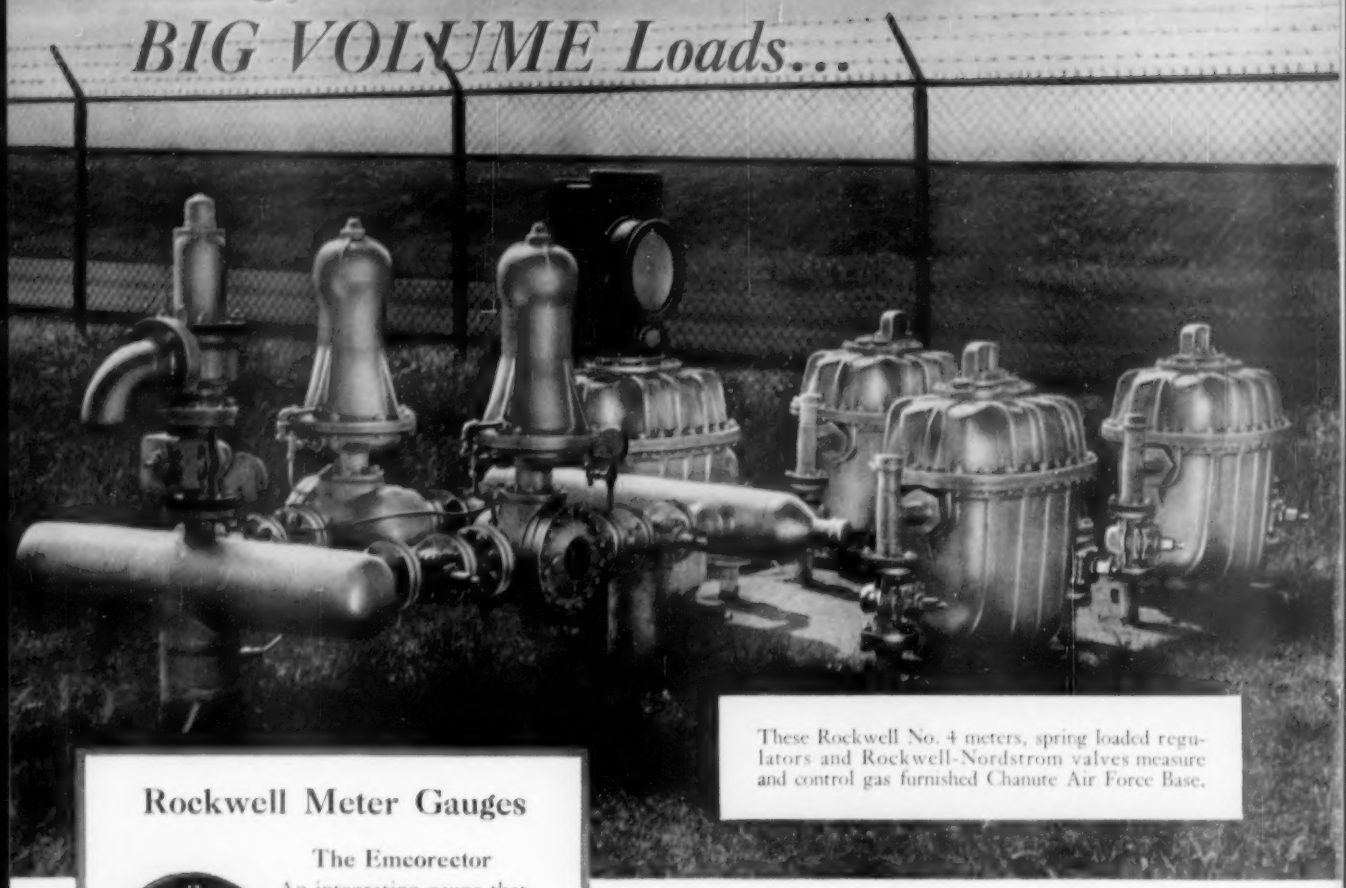
Single joint construction is an exclusive feature in Rockwell aluminum meters. Size for size there are fewer linear inches of pressure sealing surfaces than in other type meters. There's less chance for leakage in this design and greater ease and accessibility for maintenance. The completely enclosed valve plate casting carries all the working parts. It fits, pre-assembled, in the bowl type body to bring you the advantage of unit replacement economy. You can select from a *complete line* of Rockwell single joint meters covering capacity range from 150 cfh to 5000 cfh. *Write for bulletin.*

ROCKWELL MANUFACTURING COMPANY

PITTSBURGH 8, PENNSYLVANIA

Atlanta · Boston · Charlotte · Chicago · Dallas · Denver
Houston · Los Angeles · Midland, Texas · Kansas City, Mo. · New York
Philadelphia · Pittsburgh · San Francisco · Seattle · Shreveport · Tulsa

Taking the measure of BIG VOLUME Loads...



These Rockwell No. 4 meters, spring loaded regulators and Rockwell-Nordstrom valves measure and control gas furnished Chanute Air Force Base.

Rockwell Meter Gauges

The Emcorector

An integrating gauge that gives a direct reading of any volume metered at high variable pressures corrected to contract base pressure.

Combined Record Gauge

Furnishes charted records of pressures from which metered volume to any contract base pressure can be calculated. Made in both meter and clock driven types.

Rockwell Meters, Regulators and Nordstrom Valves

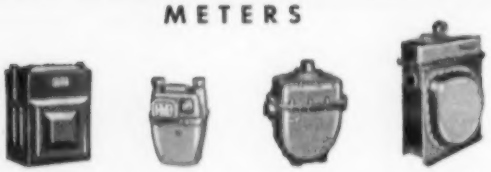
Serving well with safety might be the title for this picture. The spring loaded Rockwell "015" regulators are completely enclosed to prevent tampering. The sturdy cased Rockwell No. 4 meters withstand external forces and internal stress far above any normal expectancy. Leak resistant Rockwell-Nordstrom valves with their lubricant sealed plugs and quick, quarter-turn operation assure positive, ever ready control. For your next installation, why don't you go Rockwell all the way? Gain the security that comes from using only the finest, safest equipment.

ROCKWELL MANUFACTURING COMPANY

PITTSBURGH 8, PA. Atlanta Boston Charlotte Chicago Dallas Denver Houston Kansas City, Mo. Los Angeles Midland, Texas New York Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa

Meters and Regulators For Your Every Purpose and Need

METERS



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REGULATORS

Industrial | Service | "1001" | Balanced Valve

50 years ago . . . but as oil men we haven't done enough. The progress in 50 years is far too little, when the great good the oil business accomplishes is so little known . . .

Somewhere, somehow, we have failed and this writer for one believes we haven't faced realities and put across our messages to the public in such a way that people will accept them . . .

A soundly written history of oildom, which would not glamorize the industry but stick to facts giving the good with the bad, and which could be sold for a low price (even a paper back) might help a great deal. The A.P.I. has put out some excellent factual material, but why it hasn't gotten across is something hard to understand. Perhaps the label has had something to do with its reception.

A thorough review of our public relations is well justified. Somewhere along the line there should be a tightening up in our campaigns so that individuals will not "jump the gun." Whether we can ever reach such an ideal situation in the oil business is debatable. But we cannot accept a defeatist attitude.

Dorsey Hager, Consulting geologist, Salt Lake City.

CALENDAR

OCTOBER

18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel El Dorado, Ark.

18-21 Permian Basin Oil Show, Odessa, Tex.

22-24 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

23-26 National Association of Corrosion Engineers, south central region, San Antonio.

24-26 Tracerlab Symposium on Applications of Radioactivity, Hotel Statler, Boston.

25-26 American Society of Mechanical Engineers, American Institute of Mining, Metallurgical & Petroleum Engineers, nineteenth annual meeting, Sheraton Park Hotel, Washington.

26 Natural Gasoline Association of America, southern regional meeting, Captain Shreve and Washington-Youree Hotels, Shreveport.

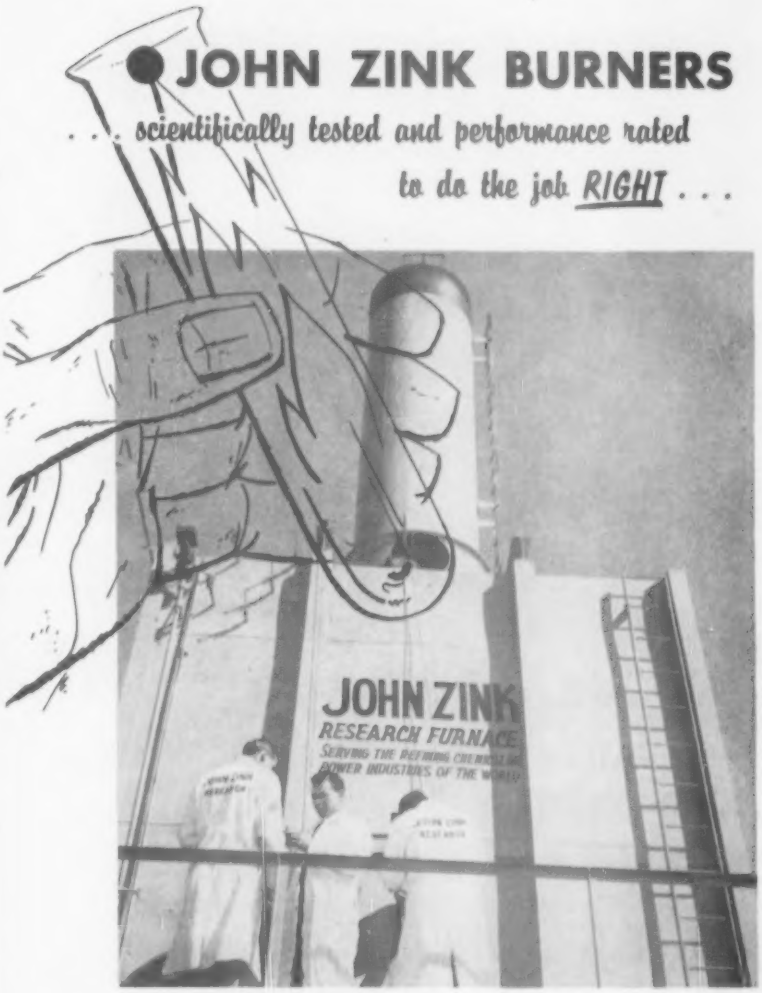
26 American Institute of Chemical Engineers, South Texas Section, eleventh annual technical meeting, Galvez Hotel, Galveston, Tex.

29-30 Illinois Geological Survey, Petroleum Engineering Conference on Waterflooding, University of Illinois, Urbana, Ill.

29-30 Independent Petroleum Association of America, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.

29-31 Energy Resources Conference, sponsored by the Denver Chamber of Commerce, Denver.

29-Nov. 1 Society of Exploration Geophysicists, annual meeting, Roosevelt Hotel, New Orleans.



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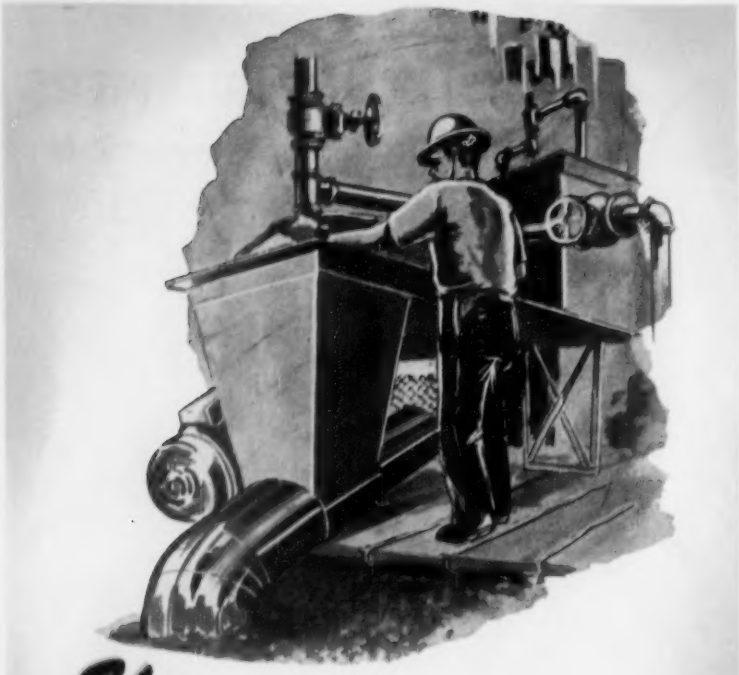

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31-
Nov. 2 Gulf Coast Association of Geological Societies, sixth annual convention Plaza Hotel, San Antonio.

NOVEMBER

1-2 Louisiana Polytechnic Institute, fifth annual instrumentation conference, Ruston, La.

7-8 Instrument Society of America, Philadelphia Section, symposium on process data logging, Stratford Hotel, Philadelphia.

8 West Central Texas Oil and Gas Association, annual technical and membership meeting, Hotel Wooten, Abilene, Tex.

8-9 American Association of Oilwell Drilling Contractors, eleventh annual drilling safety clinic, Statler-Hilton Hotel, Dallas.

8-9 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Coast Joint Regional Meeting, Ambassador Hotel, Los Angeles.

8-9 Society of Automotive Engineers, Inc., national fuel and lubricants meeting, Mayo Hotel, Tulsa.

12-15 American Petroleum Institute, thirty-sixth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.

25-27 Kansas Independent Oil and Gas Association, nineteenth annual meeting, Broadview Hotel, Wichita.

25-30 American Society of Mechanical Engineers, Statler Hotel, New York

30 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.

DECEMBER

3-4 New Mexico Oil and Gas Association, annual meeting, Alvarado Hotel, Albuquerque.

6-8 Interstate Oil Compact Commission, annual meeting, Fontainebleau Hotel, Miami Beach, Fla.

9-12 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Boston.

11-12 Water Quality Control for Subsurface Injection, conference sponsored by the University of Oklahoma, Norman, Okla.

1957

JANUARY

14-16 Pipe Line Contractors Association, ninth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

14-18 Society of Automotive Engineers, annual meeting, Sheraton-Cadillac and Statler hotels, Detroit.

17-18 Engineers Joint Council, Statler Hotel, New York.

21-25 American Institute of Electrical Engineers, 1957 winter general meeting, Hotel Statler, New York City.

FEBRUARY

13-15 National Association of Corrosion Engineers, Tulsa section, eighth annual short course for pipeliners, Hotel Mayo, Tulsa.

22 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

24-28 American Institute of Mining, Metallurgical and Petroleum Engineers, annual meeting, Hotels Roosevelt and Jung, New Orleans.

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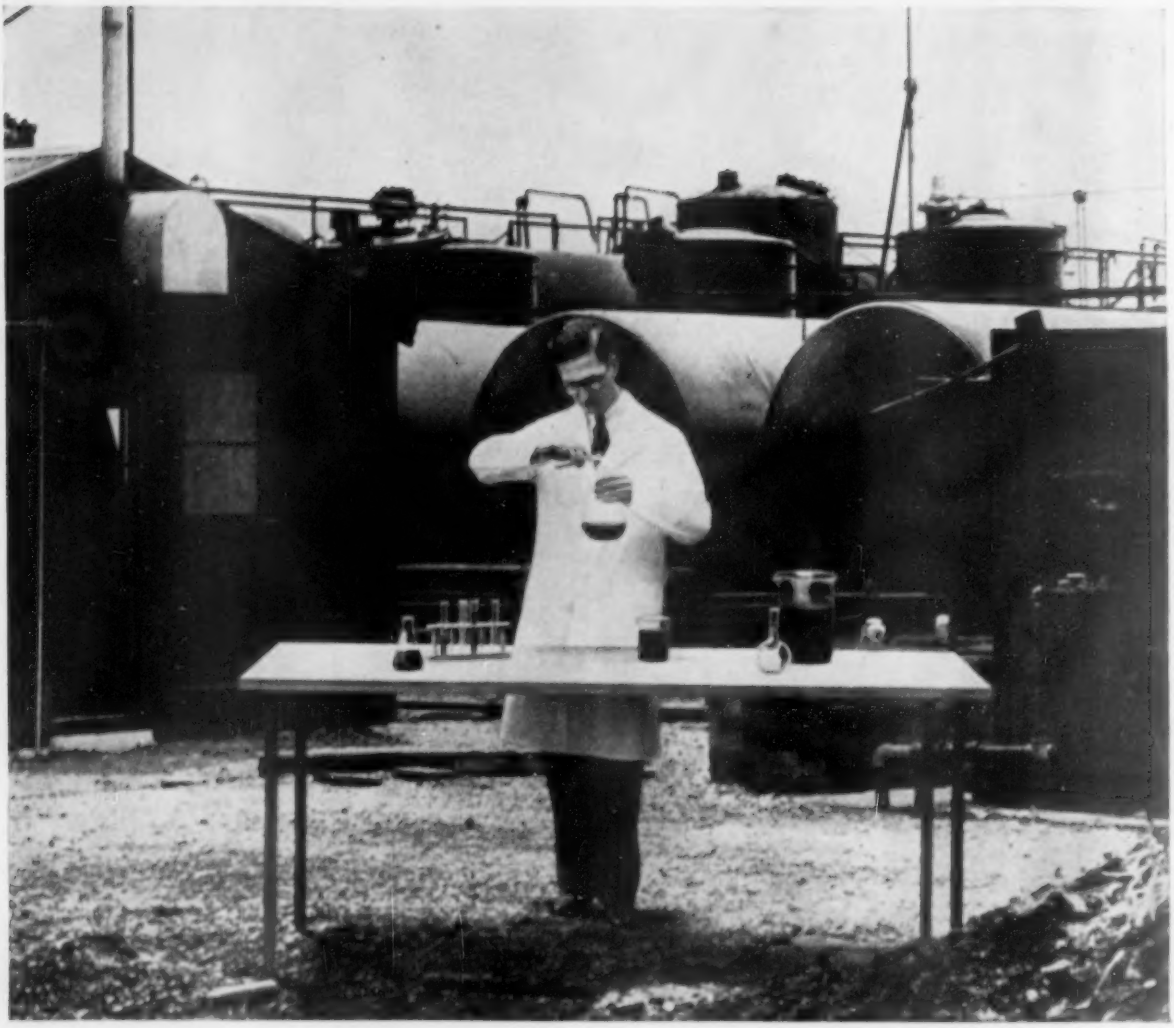

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

APSAMOAO

A FRIEND of ours thinks there aren't enough associations, societies, and movements in the oil industry so he is starting a new one, of which he is self-appointed president and, to date, sole proprietor. But he figures membership will mount rapidly.

He calls it the APSAMOAO, which stands for Association for the Prevention of Scheduling Any More Oil Activities in October.

He's the public-relations man for a big oil company and, during 11 months of the year, is a model of composure, geniality, and cooperativeness. But not in October.

We walked in on him the other day in a bad moment. His hair was disheveled, his necktie was awry, his desk top was cluttered mountain-high, his phones were jangling, and his whole staff was standing around on tiptoe trying to get some words in edgewise.

"Can't talk to you," he barked. "Don't care how important it is. Come back next month.

"Why does everything happen in October?" he asked, but didn't wait for an answer. "Our whole company is being lined up for the Community Chest drive. We've got a big oil display and program running at the State Fair. Every committee of the Chamber of Commerce suddenly wants our men to come to meetings to plan their programs for the year. Same way with every civic and professional group in town. And forty-leven industry and technical associations are having conventions all over the country in October and it seems as though several people from our outfit are on committees of every one of them. On top of that, the company budget is being worked up right now and everybody's in a huddle on that.

"Then comes Oil Progress Week right-smack dab in the big middle of everything, and you know how that ties up our people. Oil progress, bah. How this company can make any progress toward getting our own work done in October is beyond me."

As we tiptoed out, hat in hand and mission unaccomplished, we had nothing but sympathy for the poor guy. We went back to the office and counted the October meetings listed in the Journal's "Calendar of Events"—25 of them, all considered to be of national or regional importance to some branch of the oil industry. And Lord only knows how many local groups pick October for meetings which oil men are expected to attend.

Yes, we have a hunch that the APSAMOAO will be a rather popular organization in a good many segments of the industry, and that our friend may discover that he has launched a really constructive movement.

Interesting Overtime

ON Saturday the Journal's switchboard is closed. But the phones still ring, since all the trunks are "plugged through" to different offices.

Invariably there are a few staffers down who didn't get their chores done by 5 o'clock Friday, and the jangling phones become nuisances of monstrous proportions.

But sometimes you can meet some awfully nice people. Take last Saturday, for instance.

We picked up the phone to hear the pleasant voice of a sweet, but young, little girl inquiring: "Is Clea there?" Clea is the executive vice president's secretary, and the caller was her daughter.

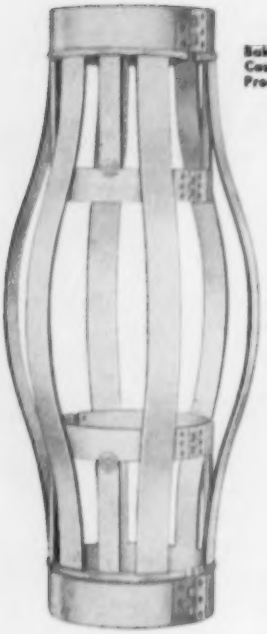
No, we said, she had left about 20 minutes earlier.

"Oh shucks," came the reply. "The garage is on fire and all Daddy's tools are burning up." The cheerfulness of the voice kept the tragedy from soaking in. There came then a happy-sounding "Thank you!" and a click.

An immediate call-back confirmed the fact that the garage WAS burning, and that all the tools of "Daddy," who is a machinist, sure enough were lost.

We hope when the young lady gets a little older she applies for a job at the Journal. There's bound to be an extraordinary future ahead for anyone who can be so calm, polite, and cheerful in the face of such adversity. Nero, for example, won immortality for just such a performance.

—*Henry D. Ralph.*



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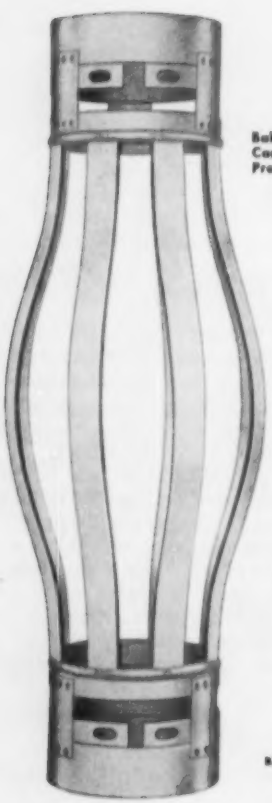

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How much progress has oil really made?

THIS is Oil Progress Week. What progress? What are we supposed to be celebrating this week? Is the oil industry really making any progress in becoming better understood by the public?

Events of the past year suggest that we're making progress backwards. Take the opposition to the Harris-Fulbright natural-gas bill as an example. That fight, and the circumstances surrounding the veto, set the industry back in public esteem by many years.

That certainly gave evidence that a big share of the public doesn't understand how the oil business functions, looks on it with suspicion, and feels that it is a public utility—in essence if not by definition—in need of government supervision.

MUCH PROGRESS has been made in the techniques of publicity. The industry's mechanisms for sending out a message are pretty well perfected. But is the right message being sent, and is it getting through?

The main theme of Oil Progress Week is that "Oil Serves You." The average consumer is already keenly aware that his way of life depends on oil —the commodity—just as it depends on water and electricity. But he doesn't seem fully convinced that oil—the industry—is serving his interests as well as it might if certain reforms were forced upon it.

It doubtless is an educational service to inform the ladies that their cosmetics, hose, and toothbrushes may be made from oil-based chemicals. But there is little visible evidence that this has won much voter support for percentage depletion or anything else the industry wants.

Technological progress the oil industry certainly has made, and it's quite in order to brag about it. But technological progress is an attribute of every American industry, and is taken for granted. Telling the public about the wonders of petrochemistry or seismology is fine, but it hasn't allayed distrust of the industry.

OIL PROGRESS WEEK, for all the good it is doing, obviously isn't the whole answer. No "week," no "publicity project," can do the fundamental job of making solid progress in winning public trust.

Real progress will come when all oil men learn to act circumspectly and to avoid incidents which put them in a bad light. A number of such incidents have occurred in recent months.

Real progress will come when every oil company, from president to pumpers, from secretaries to station attendants, becomes imbued with the necessity for presenting and exemplifying the industry's position at all times. A number of companies are doing this with earnestness and enthusiasm.

This Oil Progress Week is a good time for everyone in the industry to assay how much real progress is being made in dispelling public misconceptions about the business, and what he has contributed to it.

Engine valves for free pump are made from a hardenable chromium-nickel stainless steel, which not only resists attack by oil well corrosives, but also resists wear by metal and abrasives including sand. As a result, these valves assure the long, trouble-free performance desired by oil well operators. The pump is a product of Kobe, Inc., Huntington Park, California.

Stainless Steel adds years to "Free Pump" life ...by helping to resist corrosion, erosion and abrasion

Stainless steel valve resists failure from corrosion, erosion and wear! *Despite two to five years' pumping from the bottom of wells.*

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Type 414 (12% Cr – 2% Ni) has superior hardening capacity as compared to otherwise similar non-nickel containing martensitic grades, and also slightly better corrosion resistance. Because of its better hardening capacity, in the hardened condition it possesses superior resistance to erosion by sand and other abrasives. Valve cages made of type 414 stainless steel have shown four times the life of materials previously used for combating the severe "washing" opposite the valve balls.

Other triplex pump parts produced in nickel-containing stainless steels . . . for high strength and resistance to corrosion . . . include sleeve seals and valve ball followers.

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Current and significant in . . .

The Industry This Week

Refining

• **Confusing refining picture on jet fuels** for airlines is coming into focus. Indications are that straight JP-4 will not be accepted as one of alternate fuels without modifications. P. 103.

Southland Co. plans to start work immediately on expansion program which will triple size of its 6,000-bbl. refinery at Memphis. P. 102.

Three 200-ft. distillation towers in a single distillation train operating as one tower will be a feature of Cosden's new styrene plant now going up at Big Spring, Tex. P. 96.

Drilling

• **Early revival of drilling activity** in disputed area off the Louisiana coast is expected in wake of truce reached by U. S. and Louisiana officials. Entire dispute is long way from settlement. P. 84.

A rosy future for the turbodrill is being painted for contractors. Research experts say it ultimately may prove the most significant improvement since rotary drilling was introduced in 1901. P. 90.

Industry

• **Campaign for higher wages in oil industry** will be launched again in December by O.C.A.W. Contract goals are still secret but industry can expect them to be "something substantial." P. 94.

New plan for voluntary control of imports is expected to emerge this week. Word is controls will be tied to refinery runs rather than domestic oil production and Venezuelan oil will come under plan. P. 88.

British Petroleum has made surprise cash-stock offer of $26.8 million for Trinidad Petroleum Development Co. Move may forestall Colorado Oil & Gas deal to acquire company. P. 105.

Exploration

• **Costa Rica's prospective producer** is being threatened by salt water. Union Oil's 2 Cocoles is flowing 72 per cent salt water under extreme pressures. The well earlier had been hailed as Central America's first commercial producer. P. 106.

Notes from other foreign wildcats: Esso Standard has new discovery near Parentis field in southwestern France. P. 105. . . . Gilliland Oil of Los Angeles has spudded a test on Iskenderun Bay—the first on a concession granted under Turkey's new oil law. P. 106 . . . And British Petroleum and Royal Dutch-Shell are below 7,000 ft. in important Zanzibar test. P. 106.

Pipelining

• **Imports of Mexican gas** by Texas Eastern Transmission finally have won FPC approval. This gives Texas Eastern green light on an initial $82.7 million pipeline project with later expansion to total $147 million. Price of gas will start at 14.2 cents per M.c.f. and escalate 0.2 of a cent each year for 20 years. P. 92.

Trans-Canada has lined up another major market for its gas. It has 20-year contract with Consumers Gas of Toronto for delivery of 82,000 M.c.f. daily first year, building up to 165,000 M.c.f. daily. P. 88.

Iraq Petroleum is showing Lebanon it means business in its threat to bypass nation as result of pipeline dispute. I.P.C. has fired 120 Lebanese workers, threatened to shut down operations which will leave 2,500 more jobless. P. 104.

Truce Loosens Offshore Strait Jacket

- **Louisiana-U. S. interim agreement may revive drilling and leasing pending Supreme Court boundary ruling**
- **Nobody won in temporary settlement; heavy losers are oil men, and uncertainty clouds future operations**

Joe Reilly
Houston District Editor

NEW ORLEANS.—A truce reached last week by federal and state officials cleared the way for an early revival of drilling activity in the disputed area off the Louisiana coast. But the dispute is a long way from being settled.

Barring further entanglements in red tape, operators should be able to resume almost normal activity within a few days.

After 4 months of name-calling negotiations, opposing forces finally ironed out an interim agreement to permit new wells to be drilled while the boundary dispute is pending before the U. S. Supreme Court. Formal signing of the truce was scheduled October 12 in Washington.

The truce meeting was called 4 months and 1 day after the Supreme Court issued its "status quo" ruling halting further leasing and drilling in the disputed belt, which in places extends more than 30 miles in width.

Basic questions unanswered . . . The bitter controversy, though temporarily settled, resolves none of the fundamental issues involved in the boundary squabble.

Some of the questions it has raised may prove far bigger than anything yet solved.

Through the legal and political fog surrounding the issue, this much was apparent:

. . . No one really won in the dispute. Neither Louisiana nor the federal Government has gained recognition for its boundary claim.

. . . The biggest loser has been the oil industry. Losses in idle rigs, revised drilling schedules, and unnecessary transfer of operations have mounted daily, probably running into millions of dollars.

. . . Still to be decided, by either Congress or the Supreme Court, is the extent of Louisiana's jurisdiction in the Gulf of Mexico. So far, nobody knows where Louisiana's shoreline is. Once that is determined, it's still not clear whether the state controls the submerged lands 3 miles or 3 leagues (10½ miles) into the gulf.

. . . Both Louisiana and U. S. treasuries may suffer eventually from the long controversy and the uneasy truce. The costly squabble has dampened enthusiasm of offshore operators. Their cautious attitude likely will be reflected in future lease sales and drilling programs.

. . . Texas' claim to submerged lands 3 leagues from shore may be weakened by the wrangling over Louisiana's boundary. Federal tactics in the Louisiana case indicate a determination to push Texas' offshore frontier back to the 3-mile line.

Truce terms . . . The Supreme Court order preventing the drilling of new wells and canceling of all leases in the disputed zone provided for resumption of activities in the event of a pact by federal and state agencies. This agreement must merely be filed with the court clerk to become effective.

There may be a few days' delay in resuming activities since individual operators also must sign agreements with both the federal and state governments covering doubtful leases. Industry spokesmen expect little delay here, however, since terms of the agreement are generally agreeable to the offshore operators.

Under the settlement worked out last week, operators can drill on any disputed lease. Royalty payments would be impounded for transfer to the eventual winner in the boundary dispute.

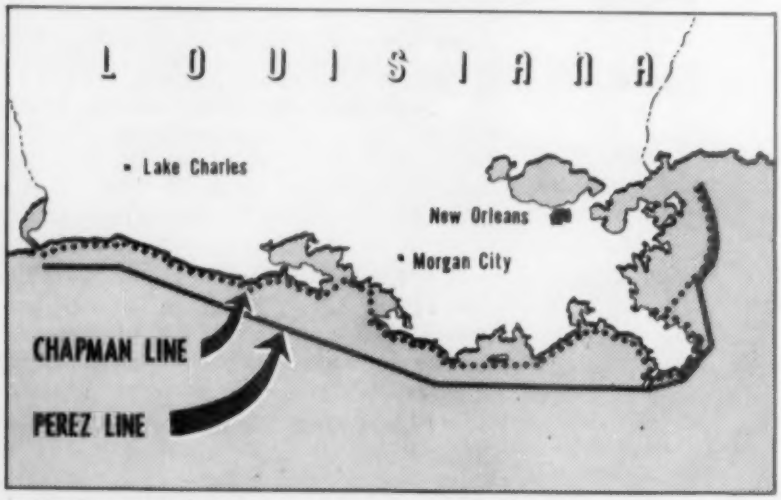
Operators now paying rentals to both agencies must continue to do so to hold their leases. As production is developed on any of these leases, rentals will cease and royalty payments then will be impounded.

Probably the major concession to Louisiana was the agreement by the Interior and Justice Departments for the impounding of federal revenue from past lease sales in the disputed area. This sum has been estimated at about $84,000,000.

The state is not required to impound money received from past sales.

The question of future leasing in the area where federal and state claims overlap was the greatest stumbling block. Secretary of Interior Fred A. Seaton has insisted on the right to reject any bid submitted at future sales in the controversial area. William G. Helis, Jr., chairman of the Louisiana Mineral Board, and State Atty. Gen. Jack Gremilion staunchly refused to yield on this point.

In a compromise reached through exchange of telegrams, they agreed to name a six-man committee to determine the "adequacy" of any future bids. Three of the men will be named by the chairman of the State Mineral Board



FUTURE OFFSHORE LEASING pending U. S. Supreme Court ruling will vary according to zones. State has free hand in Zone 1 which extends from Chapman Line to 3 miles in gulf, Zone 2, from 3-mile to 3-league lines, is in dispute with leasing permitted if federal-state agencies find minerals being drained from outside wells. Zone 3, from outer edge of Zone 2 to 3 leagues beyond Perez Line, will have no leasing for a year. Leasing will continue in Zone 4, from Zone 3 gulfward to Continental Shelf, by Interior Department.

and three by the Secretary of Interior. It will require a majority decision to reject the highest bid.

Zones for future leasing were drawn as follows:

...Zone 1 extends from the so-called Chapman Line, which roughly follows the present coast, to an imaginery line 3 miles in the gulf. This area is undisputed state property, and the state has a free hand in leasing within the narrow belt.

...Zone 2 extends from 3 miles in the gulf to the 3-league line. These two zones are the minimum—but far from the maximum—claimed by the state. Zone 2, of course, is in dispute. There future leasing will be permitted if there is a mutual determination by federal and state agencies that minerals are being drained through wells outside the zone.

...Zone 3 extends from the outer edge of Zone 2 to 3 leagues beyond the so-called Perez Line, which the state legislature defined as the state's legal coast line in 1954. Under last week's agreement, no leasing will be permitted in this area for 1 year. After that, lease sales may be scheduled and supervised by the Interior Department, subject to approval of bids by the joint committee.

...Zone 4 extends from Zone 3 gulfward to the edge of the Continental Shelf. This is not in dispute, since the federal Government's claim to it has not been challenged. Future leasing in this area is to be strictly under control of the Interior Department.

Other provisions of the federal-state pact set the minimum royalty for future leases in the disputed zone at one-sixth and minimum bonus at $15 an acre. These follow the latest federal lease forms.

The bigger issue . . . The deadlock in federal-state negotiations was broken within hours after the Supreme Court ruled that it had jurisdiction in the boundary dispute now pending. The high court gave Louisiana 30 days to answer a suit filed by the Justice Department.

The court's action indicates it plans eventually to settle the boundary question now before it. But a decision—even if it comes in the near future—might do little to restore confidence in the tidelands.

As originally drawn the suit asks the court to rule that Louisiana's jurisdiction extends only 3 miles into the gulf rather than 3 leagues, as claimed by the state. Unless the scope of the suit is later enlarged, it will not determine the boundary. For the court hasn't been asked to define the actual coast line, and nobody knows where to start measuring.

OFFSHORE BOUNDARY DISPUTE has forced operators out beyond the disputed areas. This Atlantic Refining Co. wildcat, the 1 Block 193, is an example of how the offshore search has been pushed farther from shore and into deeper water. The test is 22 miles off Galveston, Tex., in 57 ft. of water. The well, being drilled from Offshore Co.'s No. 55 mobile platform, was drilling below 8,000 ft. last week. It is expected to reach total depth late this month. Tidelands Oil Corp. and Superior Oil Co. farmed out the acreage to Atlantic.

As the case now stands, a decision would merely reduce the width of the disputed zone, leaving a belt up to nearly 30 miles in width still to be decided.

Still open to debate would be where, when, and how the actual coast line shall be determined. Would it be the coast line as it existed in 1812 when Louisiana was admitted to the union, or would it be the present low-water mark which in some places is many miles farther south? Would it be the Chapman Line, the Perez Line, or some other imaginary boundary yet to be drawn?

According to one legal theory, the very vagueness of the Justice Department's suit is a threat to the claim by Texas. If the court holds that the maritime belt off Louisiana is only 3 miles wide, rather than 3 leagues, the ruling might be taken as a precedent for a similar conclusion affecting the whole Gulf Coast.

According to this view, neither the Interior Department nor the Justice Department is willing to make any special concessions to Texas because of its claim dating back to statehood.

The fact that Texas' claim has not been challenged is no indication that it never will be.

Texas actually expects a campaign against its claim to the historical boundary.

State Atty. Gen. John Ben Shepperd sees the federal Government's suit in the U. S. Supreme Court attacking Louisiana's claim as an indication of what his state is in for.

"This suit is merely the first attempt by the federal Government to restrict the grants to the states of submerged lands to the minimum distance of 3 geographical miles," Shepperd said.

The state official is fighting a Texas Supreme Court decision in a Copano Bay land case to the effect that the common law was introduced in Texas in 1837. In a motion for rehearing, he said that ruling jeopardizes Texas' claim to ownership out to 3 marine leagues at the time it entered the union in 1845. The common-law boundary extends but 3 miles. Texas claims title out to the

farther line on the basis of Spanish-American law.

Effect of the shutdown . . . Some industry observers predict offshore development will not return to normal for at least 6 months. Some think it may never regain its lost momentum.

Because the Supreme Court order of June 11 permitted the completion of all wells which had been started, the net reduction in active rigs never was as great as had been anticipated. Some operators—perhaps all—interpreted this provision to mean that any well could be drilled for which a permit had been issued.

The latest available rig count off the coast of Louisiana shows a drop of 17 since the Supreme Court edict went into effect. On June 1 there were 90 rigs working in the area. By October 1 the total had dropped to 74.

The decrease would have been much greater had not several operators moved rigs from the disputed area to other locations, either closer to shore or farther to sea. In some instances attractive leases had to be abandoned and rigs moved to less desirable locations. Every move of this type cost each operator several thousand dollars a day extra.

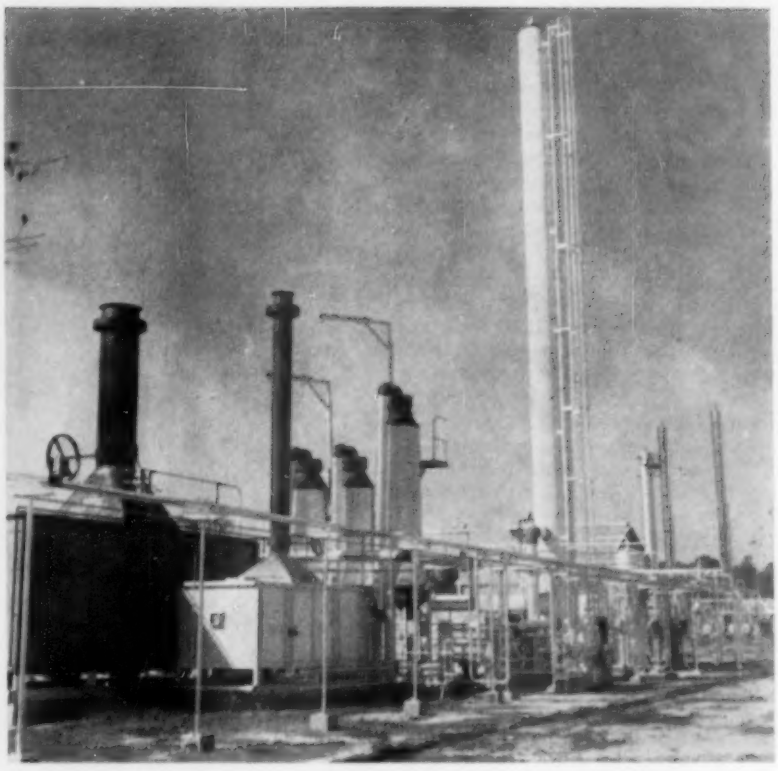
Some operators, too, had stayed on hole much longer than normal. They "stalled" on wells in the disputed area merely because they had no place else to go and wanted to keep rigs and crews at work.

Perhaps the greatest loss to date has been in disrupting drilling plans which had been based on continued expansion of operations. One operator reportedly had five platforms waiting for rigs in the disputed area. This letdown in activity hit not only the operators and idled crews but also shipbuilders, service and supply firms, and related business all along the coast.

The future . . . The future offshore now looks about as insecure as the much-heralded truce which pretends to have returned operations to normal.

Operators now know that all it takes to snarl their entire activities is a hastily drawn injunction such as the one issued in District Court last May to prevent the federal Government's proposed lease sale. This injunction, which landed in the Supreme Court, has cost them heavily during the past 4 months, and may cost more in the future.

With this in mind, some of the big operators may be a bit more conservative in drawing up future budgets for offshore work. The budgets are designed to cope with hurricane threats, dry holes, blowouts, and other hazards, but not politics.



As blending stock supplier . . .

. . . Tiny Plant Finds Its Niche

SILSBEE, Tex.—A small processing company has carved an unusual niche for itself as an intermediate between two East Texas cycling plants in turning out a high-octane motor fuel.

Through a complicated corporate and processing setup, the recently organized South Hampton Co. is converting natural gasoline from one cycling plant for use as a blending component in another cycling plant 5 miles away.

Central unit—and the only major installation—in South Hampton's plant is a 700-bbl. per day Platformer, one of the smallest in operation. The unit is designed for unattended operation, with alarms in nearby control room and two housing units to summon plant personnel in case of emergency.

The processing unit adjoins the South Hampton cycling plant in Hardin County, a jointly owned plant operated by Sinclair Oil & Gas Co. Feed stock, a debutanized natural gasoline boiling in the range of 110°-400° F., is piped directly from the cycling plant to the Platformer.

Most of the platformate is piped through a 4-in. line to Silsbee cycling plant, about 5 miles to the east, where it is sold as a blending stock to several of the owners. The Silsbee unit, owned by a different group of companies, also is operated by Sinclair.

Occasionally, part of the platformate is sold to other nearby gasoline plants for blending.

Finished product of the Platformer has a clear octane rating of about 86. When leaded, it is rated at about 97-98 octane.

It's different . . . Although several Platformers are operating in conjunction with cycling plants, the South Hampton unit is believed to be the only one which processes natural gasoline purchased from a separately owned cycling plant.

Universal Oil Products Co., which licenses the Platformer process, sees the setup as the forerunner of a trend toward increased production of blending stock from natural-gasoline condensates.

South Hampton Co., owned by John C. Breaker, of Houston, was organized specifically to build and operate the Platforming unit. The plant has been operating successfully since July.

Breaker, former vice president of Gasoline Plant Construction Corp., Houston, engineered the unit from designs furnished by U.O.P.

Fair Field Prices Jolted

Panhandle Eastern loses Supreme Court fight for price on gas it produces equal to cost of gas it purchases

WASHINGTON. — The U. S. Supreme Court has jolted hopes of pipeline companies for a fair field price for natural gas they produce on their own.

The high court last week refused to review a decision of the District of Columbia Appeals Court. The action in effect affirmed the lower court ruling that fair field price alone cannot be used in determining the value of gas produced by Panhandle Eastern Pipe Line Co.

The fair field issue also was believed an important factor in determining how the Federal Power Commission is to go about finding just and reasonable prices for gas produced by independent producers. It reached the Supreme Court after a 2-year delay following an FPC decision in April 1954 granting Panhandle the fair field price for gas produced from its own wells.

Breaks with tradition . . . The FPC has tried to get away from the traditional method of basing rates on the cost of facilities used.

It placed a commodity value or fair field price on the gas. The decision was appealed by the city of Detroit and Wayne County, Michigan. Their appeal challenged the ruling which in effect gave Panhandle's own production virtually the same treatment as gas it purchased from others.

In its adverse decision, the Circuit Court did not question FPC's right to depart from the cost rate method but it nevertheless reversed the commission. It held that while FPC need not follow the cost method strictly, it must use it as a starting point. The FPC thus must justify any new method by proving that the resulting price is just and reasonable and is not more than sufficient to provide an incentive to produce gas.

The fair field price would have given Panhandle a price increase of more than $12 million a year. Prospect of this loss prompted the company to appeal to the Supreme Court. It was joined by the federal agency.

Panhandle argued before the high court that the lower court decision would limit—if not prevent—use of an actual commodity value for gas produced by pipeline companies. This would result from "tying the FPC to the inconsistent rate-base approach and by requiring an express finding that the difference allowed the pipeline for its own gas from the use of commodity value is exactly the amount required to keep the pipeline producing its own gas."

As a result of the court's rejection of the appeal, the case now goes back to the FPC for a new finding conforming to the decision.

Array of cases . . . A heavy schedule faced the high court as it settled down to the business of the 1956-57 term.

There were only three or four cases involving FPC gas regulation, none of them presenting a major issue. But other suits brought up for review involved issues of importance to the oil and gas industry.

The Standard Oil Co. (Ind.) "Detroit case" is before the court for the second time. The suit originally centered on the "good faith defense" provision of the Robinson-Patman Act which the court upheld in 1953. But the Federal Trade Commission and Justice Department now are trying a new approach.

The Detroit case was started by the FPC some 15 years ago. Standard was charged with price discrimination in granting lower prices to four customers in that area than it allowed others in the same class. The company, failing in the lower courts, was successful in its contention that its lower prices were offered in good faith to meet the equally low prices of a competitor.

The FTC revised its original order. This time it was the Government, not the company, that failed in the lower courts. The Chicago appeals court, which upheld the original order, threw out the revised edict.

The new approach on which the Government bases its current appeal charges that Standard's pricing was part of a long-time and "inherently discriminatory" policy. The Justice Department's petition alleged it is a "system." Similar systems followed by three other oil companies in the same market area are under attack, it revealed. The court is expected to announce this month whether it will review the case.

The court also agreed to rule whether the Taft-Hartley Act gives the federal District Courts power to compel employers to comply with grievance arbitration provisions in collective bargaining agreements.

Industry BRIEFS

Zapata Petroleum Corp. of Midland, Tex., reports directors of Westag Corp., Houston and St. Louis, have approved Zapata's offer of exchanging one share of its stock for each 3½ shares of Zapata. Offer is contingent on acceptance by 80 per cent of Westag's holders and involves about $1 million. Westag owns producing oil leases and royalties in Texas and North Dakota.

Tidewater Oil Co. paid $25 an acre for oil leases on a half section of state land in northwestern Colorado's Moffat County. The bid totaled $8,000. The tract is 35 miles west and 25 miles north of Craig near the small Hiawatha oil field. The Colorado Land Board sold leases on 26,530 acres for $52,431 in bonuses. Most of the tracts were in western Colorado.

The first tanker load of Alberta crude has been shipped to Japan, but there is no indication that the spot sale of 114,000 bbl. by Imperial Oil, Ltd., has opened a new regular market for Canada. But purchase of the heavy Canadian crude would be in line with a Japanese refiners' practice of buying crude with high fuel-oil yields.

Present shipments come from Saudi Arabia, 94,000 bbl. daily; Kuwait and British Borneo, 16,000 bbl. each; Indonesia, 15,000 bbl.; Neutral Zone, 10,500 bbl.; Iraq, 7,800 bbl.; and Iran, 6,400 bbl.

The Rocky Mountain Oil Show will be held September 19-21 in Casper, Wyo. It will feature supplies and services adapted to the Rocky Mountain area. Sales at the first annual oil show in 1955 were estimated to exceed several million dollars. It is one of six such regional shows in the U. S.

The general investigating committee of the Texas house will open public hearings October 19 on state tidelands leasing procedures. Industry representatives and others will be given the opportunity to propose any changes in procedure which they deem needed.

October allowables for Alberta crude oil have been set at 412,000 bbl. per day by the Alberta Natural Gas and Conservation Board. This figure exceeds the October 1955 allowable by about 100,000 bbl. Pembina, with an allowable of 108,020 bbl., leads all fields. Redwater field, with an allowable of 72,783 bbl., and Leduc-Woodbend, with 55,775 bbl., complete the province's big three producers.

New Import Plan Drafted

Voluntary controls tied to refinery runs rather than domestic production expected to be unveiled this week

WASHINGTON.—A new basis for voluntary control of oil imports is due to be unveiled this week by Mobilization Director Arthur S. Flemming.

The new method now being discussed will be an adaptation of the one followed 16 years ago under the Venezuelan trade agreement. At that time a quota of 5 per cent of domestic refinery throughput was set up. Imports within the quota qualified for a cut in the import excise tax. Those in excess paid the full tax.

Government officials interested in the matter said the plan under consideration called for crude imports to be tied to refinery runs rather than production as in the cabinet fuels committee formula now used.

But residual fuel oil no longer will be figured in with crude. Any control necessary on residual will be set up separately.

Change in base . . . The method under study in the cabinet committee and the ODM would also make changes in the base on which imports are figured.

Canadian oil and imports into the West Coast would continue to be excluded from the allowable. But Venezuelan oil, also excluded last October, would be subject to controls again.

Imports into all areas other than District 5 (West Coast) would be figured. Thus this would catch the bulk of the foreign oil since it moves mostly to the East Coast.

The import allowable is expected to be figured at around 10 per cent of refinery runs. This will result in some cutbacks from current import levels but far less than required to get imports into conformity with the original formula of 16 per cent of domestic crude production.

In the absence of formal controls, the Government would continue to depend on the industry to keep imports within the new bounds but at the refinery rather than the import level.

The allowable probably would be set quarterly on the basis of refinery runs in a previous period as reported by the Bureau of Mines. If imports threatened to exceed the allowable, refiners would be asked to keep their use of foreign oil within the formula.

Who's hit most? . . . Refiners on the East Coast, where capacity for running foreign crude has been sharply increased, would principally be affected.

It is their expanding requirements for foreign oil that have contributed to the steady increase in imports from the Middle East. This has made the original formula ineffective.

An advantage of the proposed system is its quick response to changes in demand as indicated by refinery operations.

The new system will be a major subject of discussion at hearings on the domestic producers' application for adoption of official controls. Flemming announced that the hearings will open October 22.

No official estimate of how large a cutback the new method will require immediately has been issued. But in the first half of this year imports from all areas other than Canada into all districts except the West Coast averaged just about 10 per cent of refinery runs. Imports for the last half of the year will be somewhat higher.

If this formula is adopted and proves workable, it may save Flemming from having to report to the President that he considers imports "excessive." It had been indicated he might have to make this move following the hearings.

Alaskan Refinery Planned

EDMONTON.—Shamrock Petroleum Co., Ltd., of Edmonton, is preparing plans for a 3,000-bbl. refinery at Haines, Alaska.

Harry Heisler, Shamrock vice president, announced that if plans materialize construction will start next spring and the plant will go on stream by fall.

He said problems to be solved include arrangements for crude supplies and transportation of gasoline and other petroleum products from the refinery. The company is expected to seek use of the 626-mile military pipeline from Haines to Fairbanks to move products to the Alaskan interior.

Oil-Shale Pilot Progresses

DENVER.—Construction will start this month on Oil Shale Corp.'s main pilot plant based on the Swedish Aspeco process for extracting oil from shale.

Stearns-Roger Manufacturing Co., Denver, has the contract to build the $100,000 plant, which will have a capacity of 24 tons a day. The Denver Research Institute has completed a prepilot plant which can process 300 lb. of shale an hour.

Now that the institute has finished the heat-treatment phase of its research, Stearns-Roger can proceed with the raw shale heating equipment at the main pilot plant. This phase is to be in operation by mid-November.

Prepilot testing then will concentrate the part of the process in which spent shale, still carrying carbon deposits, is run through a combustion chamber. The combustion section of the main plant will be started when prepilot tests on reheating are finished. The project is aimed at finding a practical commercial process for getting oil out of shale *(The Oil and Gas Journal, May 28, page 89)*.

Gas Deal Approved

Trans-Canada financing to be buoyed by new contract

TORONTO. — Trans-Canada Pipe Lines, Ltd., has lined up another major market on the eve of its attempt to finance the 2,250-mile, $378-million Alberta to Montreal gas line.

The new contract was signed with Consumers Gas Co. of Toronto, which has been building up the Toronto market for 2 years with Texas and Louisiana gas delivered through Trans-Canada's Niagara-Toronto line. It covers a 20-year supply. The contract provides delivery of:

. . . 82,500,000 cu. ft. per day the first year following completion of the transmission line from Alberta.

. . . Increasing volume until it reaches 165,000,000 cu. ft. daily in the fifth year.

Trans-Canada officials estimated gross revenue from the contract would amount to $20,000,000 in the fifth year.

Other markets . . . The pipeline company announced in August that it had lined up markets for maximum delivery of 600,000,000 cu. ft. per day in the fifth full year of operations.

This includes 200,000,000 cu. ft. to be purchased by Midwestern Gas Transmission Co., subsidiary of Tennessee Gas Transmission Co. Its application to build a 2,000-mile system to distribute Canadian and Gulf Coast gas is before the Federal Power Commission *(The Oil and Gas Journal, October 8, page 124)*.

Other big contracts are with Northern Ontario Natural Gas Co., Ltd., and Union Gas Co., Chatham, Ont. Northern Ontario will receive 57,000,-

000 cu. ft. daily the first year with deliveries building to 100,000,000 cu. ft. in the fifth year. Deliveries to Union will range from a maximum of 34,000,000 cu. ft. daily the first year to 173,300,000 cu. ft. after 13 years and level off at that figure *(The Oil and Gas Journal, July 2, page 63).*

Gas Replaces Coal

Du Pont converting Belle synthetic-ammonia plant

BELLE, W. Va.—E. I. du Pont de Nemours & Co. is now in the engineering stage of converting its major synthetic-ammonia plant here from coal to natural gas. It will be supplied by United Fuel Gas Co., a Columbia Gas System subsidiary which in turn is supplied by Tennessee Gas Transmission Co. and Gulf Interstate Gas Co.

United proposes to lay a 17.7-mile, 12¾-in. line from the Coco compressor station to the plant site at Belle. The line will have a design capacity for handling 78,000 M.c.f. per day, although the initial contract with du Pont calls for only 31,000 M.c.f. per day.

If the line is completed by late 1956, estimated deliveries to du Pont per year are 3,932,251 M.c.f. in 1957, 6,434,411 M.c.f. in 1958 and 11,032,990 M.c.f. in 1959.

Du Pont will use the synthesis-gas generation process licensed by Texaco Development Corp. The synthesis gas produced from natural gas will be used in the manufacture of ammonia, ethylene glycol, and other petrochemicals. Target date for completion of the conversion is 1958.

L. A. Harbor Leases Sought

LOS ANGELES.—The Los Angeles City Council has two applications for leases on city-owned submerged lands outside the San Pedro breakwater and one request covering 2,400 acres inside the harbor.

Last week Richfield Oil Corp. requested permission from the City Council to begin negotiations for a lease covering drilling on submerged lands outside the breakwater. The area covered in Richfield's application was also filed on several weeks ago by the Los Angeles Harbor Development Co. headed by Noah Dietrich, executive vice president of Hughes Tool Co.

Another group including Standard Oil Co. of California, Edwin W. Pauley, Dietrich, James J. Arditto, and Frank J. Waters recently filed an application with the Los Angeles Board of Harbor Commissioners for a 20-year lease covering some 2,400 acres inside the breakwater.

watching WASHINGTON

. . . with Bertram F. Linz

Benzene output to continue short . . .

THE oil industry will have to more than double its present benzene capacity over the next 8 years to help meet a market demand in 1965 of at least 530 million gallons.

That is the conclusion from a survey just made by the research department of a big steel company. Unless the oil industry comes through, synthetic-rubber manufacturers and other users of materials made from benzene may have to depend on imports for much of their supply.

Benzene is produced from both oil and coal. But the supply from the latter is dependent on coke-oven operations of the steel industry. The study showed that no great increase in that output can be depended upon.

Refinery output of benzene has been increasing steadily for more than 5 years. Present capacity is estimated at 140 million gallons and output this year at 110 million, a 10 per cent increase over 1955.

The steel company's study indicated that output will have to be increased to 270-350 million gallons by 1965. Coke-oven output, it is figured, will be increased only from 185 to 210 million gallons in the same period. Even at best, it is likely that imports of 50-55 million gallons will be needed, the same as this year.

More than a third of the benzene production goes into styrene. Requirement for the latter will be 139 million gallons this year, 195 million in 1965.

Depletion believed to be safe . . .

WHO is going to control Congress and by how much will decide government policies on taxes, labor legislation, and other important matters next year.

But regardless of the makeup of Congress the depletion allowance appears at the moment to be in safer position than for several years.

There are two developments which tend to this view. One is a reported threat to counter any move to cut the oil industry's depletion by a demand that other so-called loopholes in the tax laws which benefit more taxpayers, such as the split-income provision, also be closed.

More persuasive, however, is the fact that the nation cannot afford a drilling slowdown in the face of a possible cutting off of Middle East oil.

Amortization heads for hostile Congress . . .

MOBILIZATION Director Arthur S. Flemming has put off his decision on new expansion programs for tubular goods and steel plate until after the turn of the year. As a result, the decision may be made, not in the executive offices, but in Congress, where the tax amortization program already is in trouble.

Staff reports awaiting the return of congressional committees in January are highly critical of the amortization program. They hold that the emergency needs which prompted its adoption in 1950 no longer prevail. And they point out that quick writeoff of new industrial facilities deprives the Treasury of revenue it could use now.

Further use of accelerated amortization also is meeting opposition in the President's cabinet. At least three members are known to object to its further use, holding that industry now is able and willing to make such expansions as may be necessary to meet both military and civilian requirements.

The steel industry has submitted projects totaling some $1.3 billion in anticipation of a new federally supported expansion program. But some in the industry say that quick writeoff is wanted to prevent further sharp increases in steel prices. The program can't be tied into the defense effort at this time for the simple reason that nobody knows what the military's mobilization needs will be in the fiscal year starting next July 1.

Turbodrill Future Rosy

Tool is hailed as most significant drilling development since the rotary; should be on market by late next year

FORT WORTH.—Drilling contractors stand to gain a great deal from the impending introduction into this country of the famed turbodrill.

The drill, soon to be tested in the U. S. and possibly to be placed on the market in limited quantities late next year, probably will prove the most significant improvement in drilling methods since the rotary was introduced in 1901.

This rosy outlook for the turbodrill was predicted here last week for contractors attending the sixteenth annual meeting of the American Association of Oilwell Drilling Contractors by J. H. Thacher, Jr., vice president of California Research Corp., and W. R. Postlewaite, Standard Oil Co. of California engineer.

To the U. S. contractor, they say, the turbodrill when used correctly will mean:

. . . **Faster penetration rates** in medium to hard rock. Rates also are more uniform.

. . . **Better bit utilization.** Rotating speed of bit can be maintained with depth. Lower bit loads are often possible with higher speeds. And bit weight can be maintained uniformly and with less shock.

. . . **Better use of drilling crew.**

. . . **Lighter and cheaper drill pipe and tool joints.** This is so, even though diameters of drill pipe and tool joints used will be larger.

. . . **Directional drilling** without whipstocks. Hole can be deviated at almost a 90° angle, and multiple holes can be drilled from one location. Hole deviation can be controlled satisfactorily by using heavy drill collars between the turbine and the bit.

. . . **Longer drill-pipe life.** Drill pipe, because it doesn't rotate, can be used two to three times longer. Drill pipe is discarded usually because of pipe fatigue due to high torque, whereas turbodrill pipe is retired primarily due to thread wear. Lighter wall pipe can be used with turbo due to lower torque.

. . . **Fewer twistoff fishing jobs** due to reduction in pipe fatigue.

. . . **Fewer accidents** and more orderly rig operation due to lack of rotary-table noise with the turbo.

. . . **Cut in swivel and rotary-table maintenance.** Drill pipe is turned only occasionally to free cuttings around drill stem and to get accurate weight reading.

. . . **More accurate hole gage.**

. . . **More flexible operation.** Several turbos can be coupled together in series to permit a reduction in flow rate and bit speed and still maintain, or even increase, turbine power output. This flexibility provides a better relationship between torque, bit speed, and drilling weight to satisfy varied drilling conditions.

What turbodrilling will require . . . A contractor can't just acquire a turbine and adapted bit and put these tools to work effectively with a rig set up for conventional rotary work, Thacher and Postlewaite warn.

There are some modifications which must be made.

To operate effectively with an 8 or 10-in. turbodrill, the contractor must have:

. . . **A minimum of three turbodrills** per rig to permit turbo maintenance and drilling continuity.

. . . **Adequate pumping facilities** to deliver about 800 to 1,000 g.p.m. and at sufficient pressure to satisfy the 600 to 1,000 psi. added pressure drop across the turbine. Rigs equipped for jet-type drilling may already have sufficient pump capacity.

. . . **Effective pulsation dampeners,** especially where mud pumps are operated in parallel. This smooths out the hydraulic loading on the turbo's thrust bearing, as well as bit operation.

. . . **Large-diameter drill pipe** to cut pump pressure and reduce power loss due to friction. Tool joints should have large bore to reduce resistance to mud flow.

Dual, or large diameter, standpipes and possibly dual mud hoses with a double connection into the swivel would be needed. The kelly should be at least 6-in. with a large bore. And the bit's mud passageway should be enlarged.

. . . **Mud desander** to minimize wear on both the turbine and mud pumps. Sand contact of mud should not exceed 5 per cent, with 1 to 2 per cent more desirable.

. . . **Turbine speed indicator** as aid to the driller.

. . . **Personnel experienced** in proper use and maintenance of the drill. This, the authors say, is an essential which can be gained only through the cooperation of the rig operator and the firms which will supply the new tools. Crews not familiar with the equipment should not be used.

A.A.O.D.C. ELECTED THESE MEN to direct its activities during the next year. New officers are, seated, left to right, Earle C. Hellums, Gracey-Hellums Corp., Houston, Gulf Coast region vice president; Brad Mills, A.A.O.D.C., Dallas, executive vice president; Jack Abernathy, Big Chief Drilling Co., Oklahoma City, president; J. U. Teague, president of Columbia Drilling Co., Houston, national vice president; and J. D. Huffaker, F.W.A. Drilling Co., Wichita Falls, Tex., vice president for North and West Central Texas. Standing, left to right, W. L. McClusky, M. J. Delaney, Dallas, secretary-treasurer; Frank Frawley, Frawley Drilling Co., Tulsa, vice president for Central Mid-Continent region; D. B. Ferguson, Ferguson Drilling Co., Oklahoma City, vice president, cable tools; W. C. Fatjo, W. C. Fatjo Drilling Co., Tyler, Tex., vice president, well servicing; Don Slape, Don Slape Drilling Co., Olney, Ill., vice president for Illinois, Michigan, Indiana, and Kentucky; and Marion Church, A.A.O.D.C. attorney, Dallas, general counsel. Not pictured are M. M. Brantly, Brantly Drilling Co., Midland, Tex., vice president for the New Mexico and West Texas region; Will I. Lewis, Jr., Will I. Lewis Drilling Co., Denver, Rocky Mountain region vice president; Herbert Woolf, Woolf & Magee, Inc., Tyler, Tex., vice president for Cretaceous and Tertiary basins; and R. C. Sharp, Drilling & Exploration Co., Los Angeles, California vice president.

Oil Woes Hit Drillers Too

● Excessive imports, low crude prices lop 11,000 wells from domestic drilling program, Wood tells contractors

FORT WORTH.—The related problems of excessive imports and low crude prices will cut about 11,000 wells off the total the domestic industry otherwise would drill this year, drilling contractors were told here October 9.

This was the prediction last week of Robert L. Wood, president of the Independent Producers Association of America. Wood said the domestic industry, along with losing this many wells, would be deprived annually of about $1½ billion of income and that the country would lose 150,000,000 bbl. of reserves of crude oil and natural gas.

Wood spoke at the sixteenth annual meeting here of the American Association of Oilwell Drilling Contractors.

Of the 11,000 lost wells, Wood said more than 2,000 could and would be drilled if imports were held to the recommended 1954 relationship to domestic production. Another 9,000 would be drilled if crude prices were hiked 50 cents a barrel.

Wood's statistics did not take into consideration the shortage of steel caused by this year's steel strike or availability of drilling equipment to work on that many extra wells.

How it works . . . Elaborating on his theme, however, Wood said importers now are bringing into this country a total of 300,000 bbl. daily more than should be imported according to government standards under the 1954 formula.

"Based on the present U. S. average crude price of $2.83 a barrel, that daily excess of imports means in 1 year's time, a loss of $330,000,000 (to the domestic industry)."

He said since World War II the industry has averaged seven well completions (oil, gas, and dry) for each million dollars of total income from oil and gas production. This figures out exactly to 2,310 wells which won't be drilled this year because of the income lost to imports.

A crude-price hike of 50 cents a barrel, Wood said, would net the industry 1¼ billion dollars of extra income each year at current levels of domestic production.

Again using the postwar average of seven wells for each million dollars of income, such a crude-price increase "would mean about 9,000 more wells drilled this year."

Drillers feel pinch . . . High imports and low crude prices are hurting drilling contractors in this country just as much as independent producers, Wood said.

The recent increase in the price of steel was the fourth for steel since the last small crude-oil price increase in 1953. Also in that time, oil-industry wages have gone up four times.

The squeeze on independent producers, who drill the big majority of wells in this country, inevitably means insufficient footage prices for the contractor, Wood said.

"Total income to both the domestic producer and the drilling contractor is insufficient to cover increased costs. It would be of vast benefit to both industries and to our country if we could drill the wells which imports and inadequate prices are prohibiting."

Texas U. to Offer Leases

AUSTIN.—The University of Texas will offer oil and gas leases on 140 tracts totaling 34,471 acres at a public auction in Austin November 27. The acreage, with one exception, is in small quarter and half-section parcels in Andrews, Crane, Upton, Reagan, Crockett, Irion, Pecos, and Ward counties in West Texas.

The exception is a 1,319.4-acre drilling block in Reagan County. The tract, No. 81, takes in all of Sections 35 and 26 in Block 2. It calls for a 3,250-ft. wildcat to the San Andres. Minimum cash bonus which will be considered for the tract is $13,000.

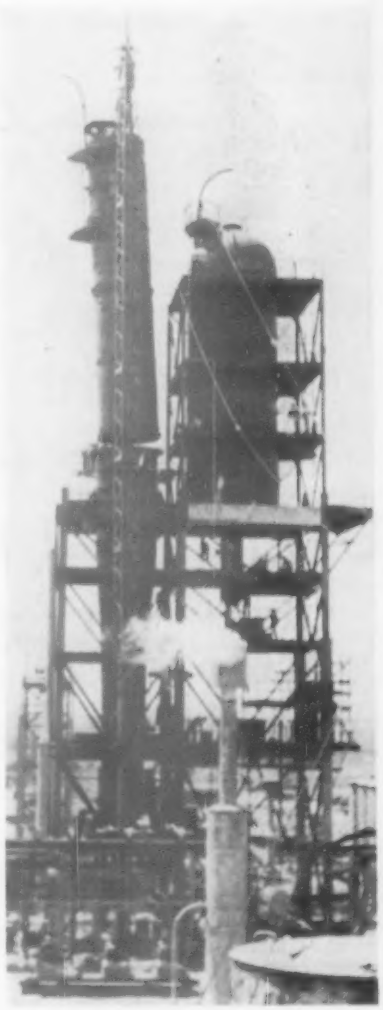
To date, the University Permanent Fund has collected $259,872,602 from such lease auctions. The all-time record for a single sale was set June 26 when the fund was swelled by almost $16,500,000.

Brazil Plans New Refinery

WASHINGTON.—The Brazilian Government oil agency, Petrobras, is seeking an American builder for a 90,000-bbl. refinery to be installed near Rio de Janeiro, the Bureau of Foreign Commerce was advised last week by the American embassy.

Petrobras is asking for "expressions of interest" from qualified American concerns. Interested companies have been asked to submit complete information on their experience and description of refineries built or designed by October 22.

The embassy cable said that presumably specific bids will be asked later of companies which meet Petrobras qualifications.



Thirty-Ton Reactor Brings Fluid Coker Near to Completion

BAKERSFIELD, Calif.—A 30-ton reactor section settles into place to bring Bankline Oil Co.'s 4,000-bbl. fluid coker a big step nearer to completion here. The coker is going up at Bankline's 8,000-bbl. refinery.

It will convert topped crude and thermally cracked fuel oil to gasoline, gas-oil, and petroleum coke. It should go on stream in December. Construction, engineering, and design is by Fluor Corp., Ltd.

U. S. to Get Mexican Gas

● Texas Eastern's proposal wins FPC approval; the deal involves $82 million initial pipeline outlay to handle 115,000 M.c.f. daily of gas; price starts at 14.2 cents

THE Federal Power Commission last week gave the first twist to the valve that will allow Mexican gas to flow northward across the Rio Grande.

The FPC approved the application of Texas Eastern Transmission Corp. to import Mexican gas about a year after the company signed a contract with Petroleos Mexicanos (Pemex) to buy the gas *(The Oil and Gas Journal, September 5, 1955, page 66, and October 3, 1955, page 98)*. Initial deliveries will be 115,000,000 cu. ft. daily, to build to 200,000,000 cu. ft. when Mexican reserves warrant.

Detailed plans were laid before the commission last December.

The FPC's green light not only marks a historic event, but a major capital expenditure for Texas Eastern as well. It will mean an initial outlay of $82,700,000 and a later expansion to be covered in another application could swell the total to $147,000,000 before its program is completed.

Here's what the FPC approved for construction:

. . . **A 422-mile, 30-in. line** from a midpoint in the Rio Grande River near McAllen, Tex., to the Vidor compressor station near Beaumont (see map).

. . . **A 45-mile lateral** of 24-in. linking the 30-in. line to McAllen with Texas Eastern's present system near Provident City, Tex. The joining of the new Mexican line with supply sources in the Wilcox Trend below Provident City will provide greater flexibility for the system.

. . . **About 77 miles** of 30-in. looping between Kosciusko, Miss., and Uniontown, Pa., in the company's existing 5,600-mile pipeline system which extends from the Texas-Louisiana-Mississippi gas-producing area to the Philadelphia-Newark consumption centers.

. . . **Additional compression** of 32,250 hp. at new and existing stations. A subsidiary, Texas Eastern Penn-Jersey Transmission Corp., also will add 33,300 hp. in the east and will lease the facilities to the parent company.

. . . **147 miles of supply** and sales laterals.

New delivery capacity . . . The line to Mexico and 30-in. loops will increase Texas Eastern delivery capacity by 250,000,000 cu. ft. daily.

Northeastern Mexico fields will supply less than half this volume at first. Other sources have been lined up along the present system.

Texas Eastern said construction would start immediately. Completion is expected by the fall of 1957. The system is to be in operation with Mexican gas going to expanding eastern markets already served by the transmission company by next heating season.

Another expansion of 200,000,000 cu. ft. daily also is in the offing, pending outcome of the Little Inch conversion case now back before the FPC after receiving earlier approval.

If the Little Inch gas line is converted to products, as Texas Eastern requests, another 30-in. looping program will be ordered to replace capacity lost in the switch. Hearings on this matter are scheduled for October 29.

Evolution of the deal . . . The FPC action last week climaxed a campaign of more than 5 years by a number of companies trying to make a deal for Mexican gas.

Texas Eastern walked away with half its prize in September 1955 when it signed a contract with Pemex, something no other company had been able to achieve.

The contract calls for purchase of 115,000,000 to 200,000,000 cu. ft. of gas daily from Pemex over a 20-year period.

The price will start at 14.2 cents per M.c.f. It will escalate 0.2 of a cent each year on November 1 for the life of the contract.

This price has caused no small amount of bitterness among southern Texas producers who have been supplying Texas gas to Monterrey, Mexico, for years at a fixed price of 4.5 cents per M.c.f. Pemex has gradually been taking over the Monterrey market as production increased from Mexico's northeastern fields.

The reaction . . . Approval of the import plan should greatly encourage Texas natural-gas producers.

That was the tack taken by Texas Railroad Commissioner Ernest O. Thompson. He said:

"First, the approval by the Federal Power Commission recognizes the need for more natural gas. Second, the price of 14.2 cents per M.c.f. shows that FPC is recognizing that natural gas is now worth more than in the past."

Thompson then put in a plug for other Texas gas producers. He said, "Surely domestic gas closer to market is worth at least 14.2 cents plus the saving in transport cost to the pipeline."

The importation was opposed by coal interests and the city of Pittsburgh. However, the FPC in its ruling held it is "clearly not inconsistent with the public interest."

The FPC added that imports will be "indicative of mutual benefit which our country and its neighbor to the south may receive by commercial relations and is illustrative of the mutual faith,

confidence, and respect each has for the other."

Growing Mexican reserves . . . Texas Eastern negotiated its contract with Pemex shortly after the Mexican Government company completed the $7-million gas-absorption plant at Reynosa.

The 300,000,000-cu.-ft.-daily plant is fed by three gas fields in northeastern Mexico where Pemex now has 18 rigs developing further gas production.

In its FPC application, Texas Eastern said that these three fields have reserves estimated at almost 840 billion cubic feet. Last June, Pemex reported available gas from the northeastern fields had reached at least 425 million cubic feet daily. The supply is increasing at the rate of 100 million cubic feet daily per year, Pemex added.

It said the Reynosa area gas fields should be able to supply 1 billion cubic feet of gas daily in the not-too-distant future if development continues at the present pace.

This means that the volumes which Texas Eastern plans to import would barely make a dent in the supplies to be available from those fields. Around 90,000,000 cu. ft. daily from the Reynosa plant is being piped to Monterrey for local distribution.

More deals to come? . . . This leaves a large surplus which will be looking for a market on both sides of the border, if Mexican reserves estimates are accurate.

Texas Eastern might be interested in tying up more reserves as they are developed, and companies which lost out in the first round can renew their bids for Mexican gas to meet growing U. S. markets.

The price is fairly high now. It's about the same as the going rate for new gas in Southwest producing areas which are much closer to their markets. But it will escalate to only 18.2 cents in 20 years, which is lower than prices now being paid for gas off the Gulf Coast.

Only a few weeks ago, Tennessee Gas Transmission Co. disclosed it had signed gas supply contracts with the C.A.T.C. group of offshore operators calling for an initial price of 21.4 cents per M.c.f. The price will escalate to 29.4 cents per M.c.f. by 1974. If the contract is extended, cost eventually will reach 35.4 cents per M.c.f. *(The Oil and Gas Journal, September 24, page 85).*

T.G.T. has filed with FPC for permit to carry out a $166 million pipeline expansion project to handle the additional 6.6 trillion cubic feet of reserves dedicated. It would take the gas at the rate of 1,000 cu. ft. daily for each 8 million cubic feet of reserves.

Pipeline BRIEFS

Buckeye Pipe Line Co. has completed reconditioning of its crude line from Griffith, Ind., to Lima, Ohio. Buckeye handled all the work on the 191 miles of 8-in. pipeline.

Fulton Banister, Ltd., has received the contract to build a 6-in. natural-gas line for Mid-Western Industrial Gas, Ltd., from a new gasoline plant at Redwater, Alta., to the nickel plant at Fort Saskatchewan. Work is to begin immediately on the 18-mile line. Completion is expected before the freeze-up.

Rangeland Pipe Line Co., Ltd., is scheduled to complete its crude gathering system and main line in West Central Alberta around November 1. Dutton-Williams Brothers, Ltd., has the contract for 46 miles of 12-in. and 6-in. in the Rimbey-Joffre area.

The system will extend from the west end of the Joffre field to link West Joffre, Bentley, Gilby, and West Gilby, with Rimbey. Texaco Exploration Co. will extend its facilities to Rimbey to move the crude to Edmonton. Initial throughput of Rangeland will be 3,300 bbl. daily, to be raised later to 10,000 bbl.

Dutton - Williams Brothers, Ltd., is water testing the heavy-wall gathering and reinjection system it has laid for British American Oil Co., Ltd., in Pincher Creek field, Alberta. Pipe in the field, which will be a major supplier of Trans-Canada Pipe Lines, Ltd., is 12-in. and 8-in.

Service Pipe Line Co. plans to lay 30 miles of 3, 4, and 6-in. to connect 16 new leases in Antelope, Charlson, Sanish, and Blue Buttes pool in McKenzie County, North Dakota, to its crude gathering system. Bids have been requested from contractors.

The new gathering lines will feed into the 157-mile trunk system linking Tioga and Beaver Lodge fields to the north with the 33,000-bbl.-daily Standard Oil Co. (Ind.) refinery at Mandan, N. D.

The 1955 edition of the annual "Statistics of Natural Gas Companies" has been issued by the Federal Power Commission. The publication is based on annual reports filed by 111 companies. It includes individual company financial and operating information plus composite financial and operating statements for 1945-1955.

Operating revenues of natural - gas pipeline companies reporting to the Federal Power Commission increased 11.8 per cent last July over the same month in 1955. Revenues amounted to $147,067,202. Revenues for the year ending in July were up 17.1 per cent to $2,041,454,506. Gas sales to other gas utilities for resale in July totaled 393,685,000,000 cu. ft., 10.4 per cent over July 1955.

A 25-mile gathering and transmission system will be moving crude from Weyburn and Halbrite fields, in southeastern Saskatchewan, before the end of the year. Trans-Prairie Pipelines, Ltd., is stringing 8 and 4-in. pipe to the railroad at Halbrite and to the Midale terminal of Westpur Pipe Line Co. Cost is estimated at $764,000.

The fields are expected to grow to around 200 wells capable of producing 15,000 bbl. daily. Recoverable reserves are placed at 100 million barrels. Current production is 3,500 to 4,000 bbl. daily.

Also for Pipeliners . . .

Pipeline companies received a jolt when the Supreme Court refused to review a lower-court decision that fair field prices alone can be used in determining the value of natural gas (P. 87) . . . Consumers Gas of Toronto signs a new contract with Trans-Canada (P. 88) . . . Texas Eastern will start laying pipe immediately on a 30-in. line that will pick up Mexican gas at McAllen, Tex., and move it north into Texas Eastern's system (P. 92) . . . FPC has indicated it may be sympathetic to gas producers with good reasons to stop sales to interstate pipelines (P. 94) . . . Dutton-Williams is spreading into construction fields other than pipelining (P. 95) . . . FPC announces it will hear oral arguments on Midwestern's proposed pipeline (P. 96) . . . Rangeland Pipe Line is trying again to build a crude line from South-Central Alberta to Edmonton (P. 99) . . . A new idea turns up a new record for laying pipe under water (P. 100) . . . Northern Natural awards contracts for 164-mile extension of system (P. 101) . . . I.P.C. threatens to shut down lines through Lebanon as pressure from government grows (P. 104) . . .

PLUS THESE TECHNICAL FEATURES: Use of plastic pipe in oil fields (P. 117) . . . Sampling particulate matter in high-pressure gas streams (P. 120) . . . and construction tables (P. 155).

Union Maps Wage Drive

Substantial pay boost will again be O.C.A.W.'s goal in 1957 negotiations; drive will be launched in December

DENVER.—The Oil, Chemical and Atomic Workers International Union will launch its 1957 campaign for higher oil industry wages in December.

The benefits to be sought for the union's 100,000 oil workers will be decided at a meeting here December 7 of the organization's bargaining policy committee. This group annually establishes mandatory bargaining programs.

Most contracts covering O.C.A.W. members working in refineries expire January 1, 1957. By next May some 90 per cent of all O.C.A.W. agreements will terminate, with the remainder running out by July.

The amount of any raise to be demanded was not disclosed by O. A. (Jack) Knight, O.C.A.W. president, in his letter calling the committee meeting.

"We intend to wage a strong drive for a wage increase," Knight said. "We are going to ask for something substantial—not just a token increase."

Knight said the decision to seek wage increases was made after surveying the oil industry and getting the opinions of union members employed in the industry. He added he was convinced that with a properly planned program the union could secure substantial general wage increases.

The O.C.A.W. president conceded the union had made good wage gains in the industry in recent years but declared "we still have not secured our fair share of the fruits of that industry."

Line of argument . . . Knight indicated the union would use the same arguments in the upcoming wage drive it employed last year.

He noted that the oil industry had made remarkable profits since World War II. He attributed them to increased productivity of the workers. Knight said the number of employes on payrolls of the oil companies has remained virtually unchanged for the last 6 to 8 years, yet production, sales, and profits of the firms have increased.

"In other words," he said, "The oil companies have been producing, refining, transporting, and selling more oil without hiring more labor. As a general principle, we do not object to this. It is progress. We do believe, however, that the profits from this progress should be equitably divided between capital and labor. We believe a higher standard of living is due to oil workers and that it is available to them without endangering the economic position of the companies and without raising prices to consumers."

The last general wage increase in the oil industry was granted effective last February. It amounted to 6 per cent, or 15 cents an hour, whichever was greater, plus improvements in night-shift premium payments.

There are nearly 600 oil company bargaining units in O.C.A.W. Most of the workers are employed in refineries, with the remainder in pipeline, oil field, and wholesale marketing classifications.

Knight has indicated he believes the oil workers' "fair share of the fruits" of the industry is nearly double the current average wage of $2.65 an hour.

Speaking before O.C.A.W. District 4 Council in Houston, Tex., recently, Knight declared:

"We ought to be talking about $5 an hour wages."

Sinclair drive . . . Meanwhile, the Sinclair nationwide council, which represents 15,000 O.C.A.W. members employed by Sinclair Oil Corp., also is mapping a drive for improved fringe benefits next spring.

The present contract, largest O.C.A.W. agreement in the industry, expires June 15, 1957. Wages for Sinclair workers represented by the union are determined in the industry-wide negotiations, leaving fringe benefits to be worked out before the June 15 deadline for signing a new Sinclair national work contract.

The council, meeting recently in Tulsa, appointed a committee to study hospitalization and surgical insurance plans. The group will report to the next council meeting February 23-24, also in Tulsa.

Pure Faces Strike Threat

NEDERLAND, Tex.—A second Gulf Coast refinery faced a strike threat last week.

Members of Local 4-228, Oil, Chemical and Atomic Workers Union, authorized a strike against Pure Oil Co. at the Smiths Bluff refinery. The group's work contract expired in September. Date of the threatened walkout has not been set.

Members of an independent union representing more than 4,000 workers at Humble Oil & Refining Co.'s Baytown, Tex., plant authorized a strike vote in mid-September *(The Oil and Gas Journal, September 17, page 127)*. The vote has not yet been called.

R. R. Dawson, president of the Baytown Employes Federation, said the company was given a 60-day notice of the threatened strike vote in a letter dated September 18. He added, however, that the vote can be taken at any time.

Gas Sales Switched

FPC permits producer to halt interstate delivery

WASHINGTON. — Producers with good reason to stop gas deliveries to interstate pipelines may find the Federal Power Commission sympathetic to their requests to do so.

This was indicated last week. The FPC allowed the Atlantic Refining Co. to halt sale of gas from the Jeanerette field in St. Mary's Parish, Louisiana, to United Gas Pipe Line Co.

The order was significant because gas which United will lose will go into intrastate commerce, free from FPC regulation.

It also was the first such move involving a substantial volume of gas. Atlantic told the FPC that with new production facilities and an additional well it can produce up to 27,000,000 cu. ft. daily.

Atlantic sought the abandonment order because United was taking so little gas (it averaged 3,037,000 cu. ft. daily through 1955) that it was being forced to flare about 3,000,000 cu. ft. daily.

The company claimed its properties could produce between 12,000,000 and 13,000,000 cu. ft. daily from wells now connected to United. But United was taking only a fraction of that potential. Terms of the contract did not economically justify the additional facilities Atlantic wants to install.

Atlantic plans to sell the Jeanerette field gas to Louisiana Intrastate Gas Corp. The price would make building of the new facilities possible, it said. And the sale would result in conservation of gas now being flared in the field.

United offered no opposition to Atlantic's application. The FPC staff counsel, however, raised objections but was overruled by the commission.

Adena Unit Fight Avoided

Petroleum, Inc.'s decision to join other operators kills Colorado's controversial oil-in-place allowable formula

DENVER. — Colorado's oil-in-place formula for figuring allowables has been shelved and a court test of the precedent-setting and controversial plan avoided.

The short-lived formula was applied in August by the Colorado Oil and Gas Conservation Commission to limit production from Adena field, the state's second largest. It was the first time the method had been used *(The Oil and Gas Journal, August 13, page 100)*.

The plan was devised to allocate production in the field which was only partially unitized. The unit covered the entire field except for four leases and 21 wells owned by Petroleum, Inc., which opposed the unit. However, use of the plan was forestalled last week when Petroleum, Inc., agreed to join the unit.

Petroleum, Inc., previously had petitioned Denver District Court for a restraining order to halt enforcement of the allowable based on oil in place owned by the different parties *(The Oil and Gas Journal, August 27, page 72)*. The suit eventually was expected to test constitutionality of the formula.

One of the principals in the case expressed "regret that no ruling was obtained" on legality of the unusual proration plan. But otherwise the solution apparently satisfied all parties.

The arguments . . . Petroleum, Inc., originally objected to the proposed unitization plan and then to the state's allowable plan.

The company in both instances declared the plans did not give it a fair division of the oil produced. Petroleum, Inc., discovered the field 5 years ago, and its current production represents 11.7 per cent of the field's output.

Under the first unitization plan Petroleum, Inc., was offered 8 per cent of the field's production to join the unit. When it refused to join, the state commission then was faced with setting an allowable for the partially unitized field.

The commission came up with the formula to divide the 14,000-bbl. daily allowable for the field among the various parties on the basis of oil in place under the various leases. Under this formula Petroleum, Inc., would get 5 per cent of the field's production.

Petroleum, Inc., was expected to contend in its court case that there was no accurate method of telling how much oil was in place originally since field conditions have been changed by 5 years of drilling. It also was expected to argue that the 5 per cent production allotted to it was not a fair share.

But Petroleum, Inc., agreed to join the unitization plan under a compromise which will allow it a 10 per cent share of the field's production.

What's ahead . . . Warwick Downing, chairman of the commission, said the unitization plan now will permit doubling potential maximum oil recovery.

He added that the agreement will permit maximum use of secondary-recovery methods including water flooding and gas reinjection. Pure Oil Co. will be operator for the 90 firms and individuals operating in the field.

Art Jersin, commission director, reported total potential Adena production is now estimated at 67,519,000 bbl. Earlier estimates had put potential recovery at 32,000,000 bbl. Jersin said oil production is expected to continue for 13 more years with gas production continuing for about 20 years.

Downing reported that with complete unitization, maximum possible recovery at Adena is now estimated at about 50 per cent. At Rangely field, Colorado's largest, maximum recovery is estimated at about 20 per cent.

Pipeliner Builds Integrated Business

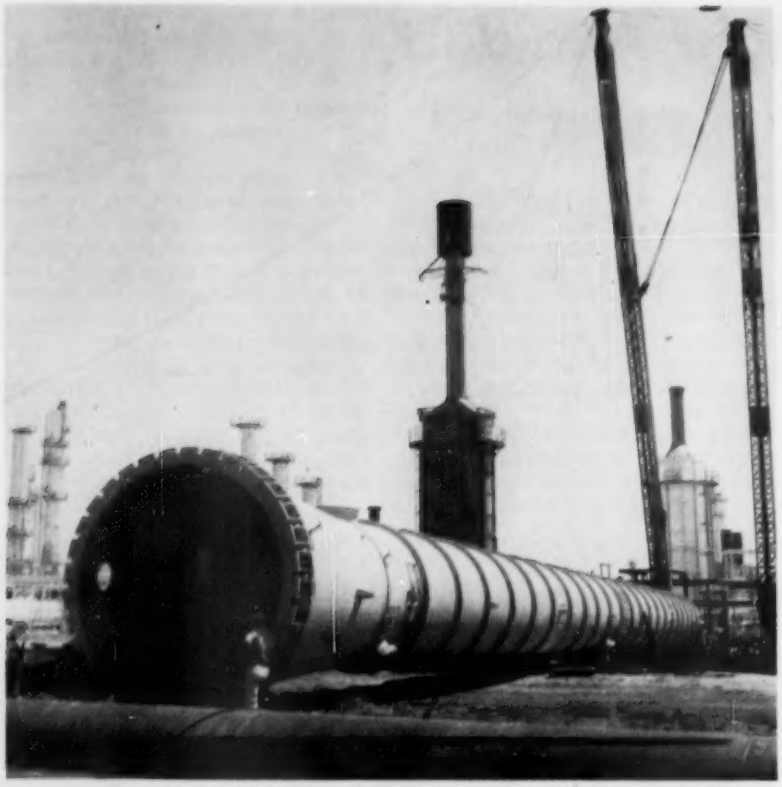
CALGARY.—Dutton-Williams Brothers, Ltd., formed just 2 years ago, has built up a diversified construction business which is keeping more than 2,000 persons busy this season.

Activity this year includes over 800 miles of pipeline construction and some $10 million in plant construction and maintenance contracts.

The plant division provides construction, maintenance, and installation service from oil-field tank-battery installation to erection of a crude unit at a major refinery. The division also designs and modifies equipment to meet western Canada's severe climate.

The pipe yard operations (above photo) in connection with stringing on the Westcoast Transmission Co., Ltd., gas line point up the company's major field of activity. Dutton-Williams Brothers has five pipeline spreads operating.

The relatively new firm was formed in July 1954 by a merger of Canadian Pipe Line Construction Co., Ltd., and Williams Brothers Corp. (Canada), Ltd. Mervyn (Red) Dutton, head of numerous business enterprises in Canada, is president. R. George Murray, Jr., a Texan who has been connected with refinery, gas plant, and pipeline design and building since 1920, is executive vice president. Vice president is David Williams, Jr., who is also vice president of Williams Brothers Co., Tulsa.



Distillation train featured . . .

. . . Cosden Styrene Plant Rises

BIG SPRING, Tex.—A feature of Cosden Petroleum Corp.'s new styrene plant will be three 200-ft. distillation towers in a single distillation train, operating as one tower.

One of these towers has been delivered and is being erected, along with a fourth which is 185 ft. high. Delivery of the other two has been held up by the steel strike.

The three-tower arrangement will provide a total of 600 ft. of distillation capacity with more than 300 trays. A mixed xylene stream from the new Platformer-Udex unit at the refinery here will be charged to these towers and ethylbenzene will be removed for further processing.

This stream will then be dehydrogenated to the styrene product. The 185-ft. tower (see photo) will be used for styrene finishing.

Erection of the four mammoth towers will reshape the plant's profile considerably. Highest tower heretofore has been the 124-ft. deisopentanizer. The highest structure at the refinery is the stack on the catalytic cracker which extends 180 ft. above ground.

All of the towers are 9 ft. in diameter. The three larger ones weigh 214,048 lb., including internals.

The towers were fabricated by Wyatt Metal & Boiler Works. The styrene plant was designed, engineered, and is being erected by Badger Manufacturing Co., Cambridge, Mass.

Original onstream date for the plant was early fall, but the steel shortage growing out of the July strike upset the timetable. The target date for completion has been changed to this winter, according to Dan M. Krausse, vice president for manufacturing.

Midwestern Hearing Set

WASHINGTON.—The Federal Power Commission will decide whether the fight against the Midwestern-Tennessee Gas Transmission plan to market Canadian and Gulf Coast gas in the Midwest shall be called off or run to a finish.

The FPC announced last week that it would hear oral argument October 22 on the motion of a handful of pipeline companies and coal and railroad groups to dismiss the companies' applications. Examiner Francis L. Hall recommended September 28 that the motions be dismissed *(The Oil and Gas Journal, October 8, page 124)*.

Hall's recommended decision was subject to appeal by interested parties until October 18. The commission, however, did not wait for objections to come in. It held that the matter is so important that the motions should be disposed of immediately.

Radio Net Feasible

Industry's facilities could be basis of wartime system

WASHINGTON.—Wire and radio facilities of the oil and gas industries could be linked into a nation-wide network in case of an emergency, the Interior Department has been told by the National Petroleum Council.

The NPC committees making the report, however, warned that the federal Government's use of the system should not be allowed to interfere with the day-to-day operations of the petroleum industry.

It was pointed out that a single industry network would be of great value to the Government and that it would minimize possible after-effects of an enemy attack. But much planning and additional construction would be needed before such a system could be put into effect.

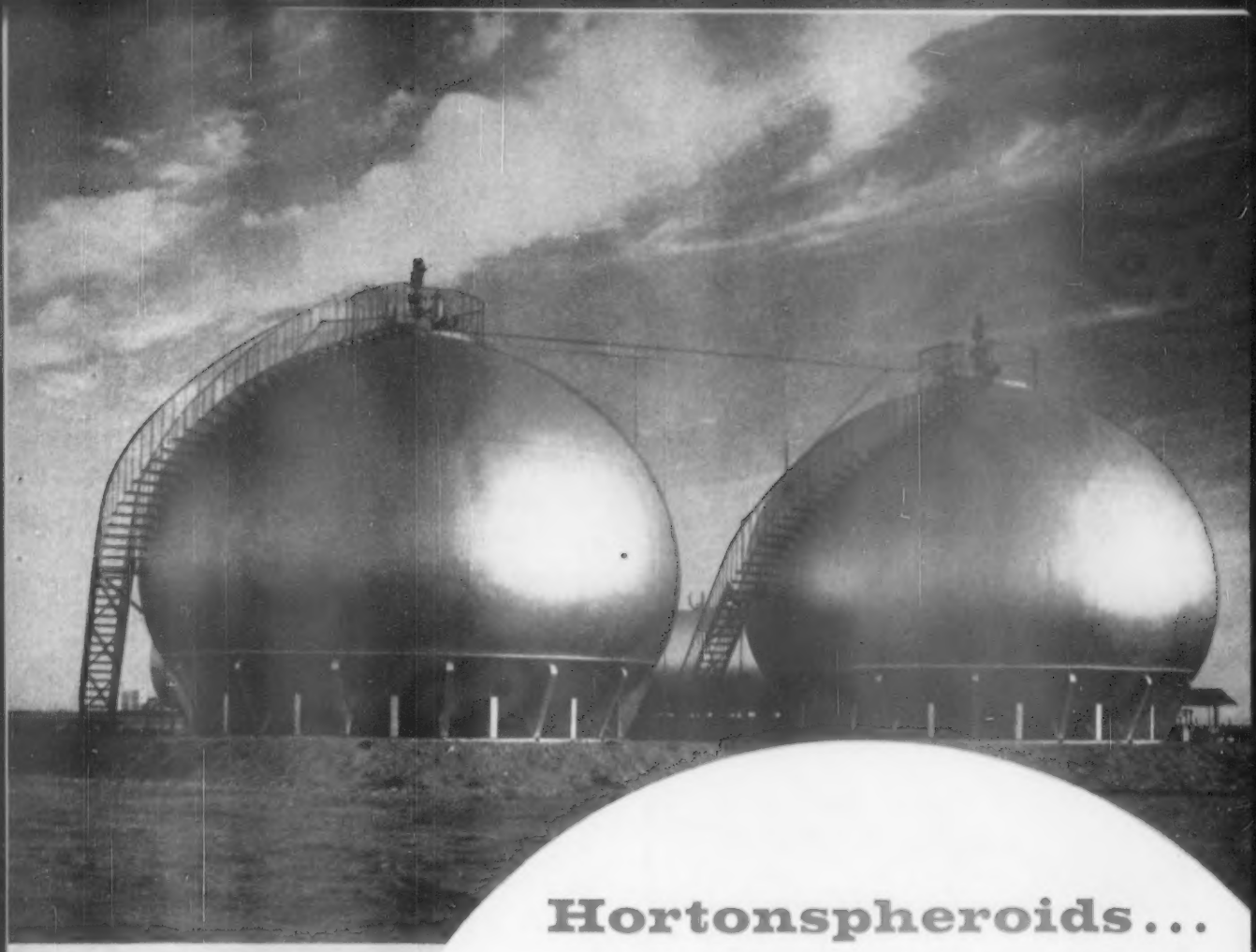
Latest figures indicate there are more than 41,000 transmitters in operation in the petroleum radio service alone and hundreds more operating in other services. As much as $50,000,000 may be invested by oil interests in microwave systems. The petroleum industry has more than 170,000 miles of owned wire lines and 55,000 miles of lines under lease.

Council gets support . . . Approval to continue NPC as it is now set up was given by Interior Secretary Fred A. Seaton, meeting with the group for the first time.

The secretary's support indicates some strong opposition if Congress and the Justice Department ever press their views that the council should be headed by a government chairman, as is the case with other advisory groups.

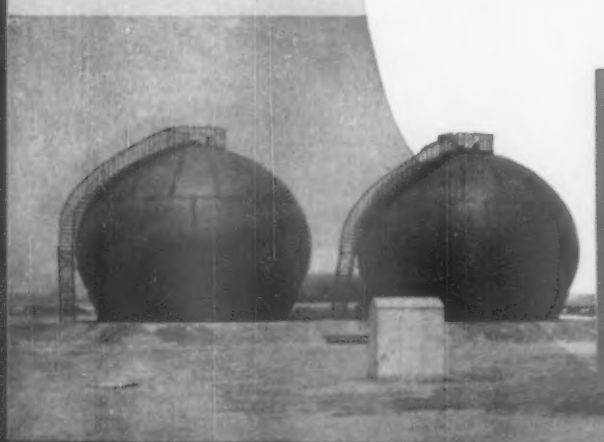
Any new emergency oil agency set up by the Interior Department, however, should include an emergency communications director, the NPC stressed in its report. It continued that regional organizations under the Washington agency should have communications directors.

The communications report was one of two submitted at the NPC's fall meeting, the first since last January. The other report, dealing with manpower in the industry, listed critical occupations from which employes should not be heedlessly drafted into military service in time of war.



Above: Two 5,000-bbl. Hortonspheroids®, both pickled and painted by the Horton Pickling Process, built for the Atlantic Refining Company, Lovington, New Mex.

Below: Atlantic Refining Company's two Hortonspheroids before final painting, showing the prime coat of paint applied in the Horton Pickling Process.



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Horton pickling facilities are available at CB&I's four strategically located plants. Further information on the pickling of Horton steel plate structures may be obtained by writing our nearest office.

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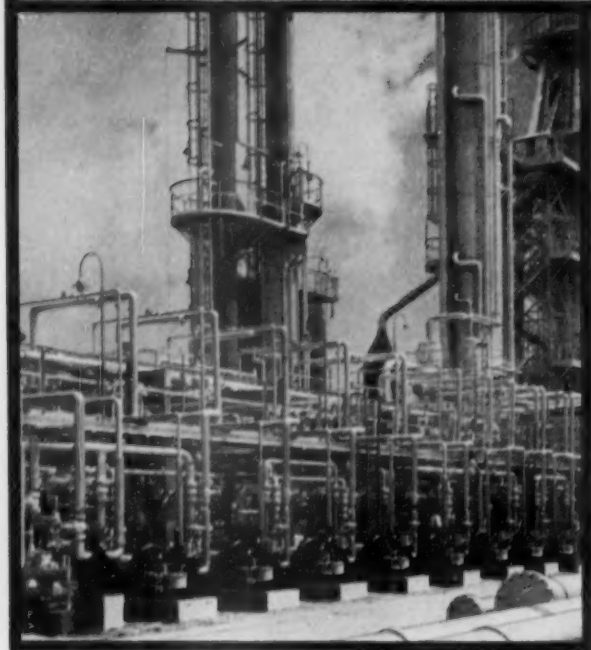
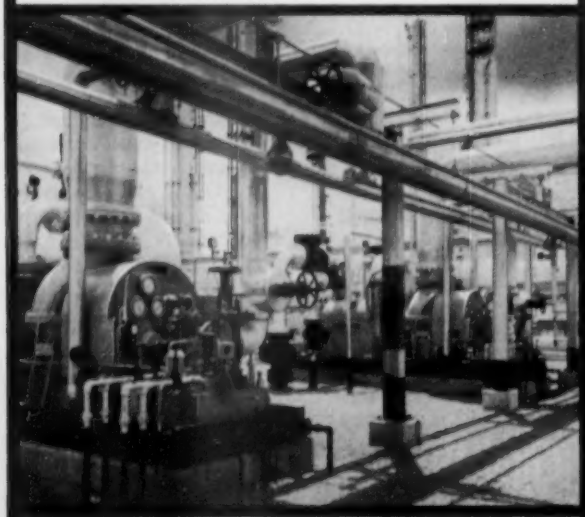
Which Steam Turbine For Your Job?



(Above) Seventy-five Elliott turbines, sized from 8 to 224 hp, drive pumps and fans throughout this Southwestern refinery.

(Below) Two Elliott 2100-hp, 4450-rpm, multistage single-valve turbines driving lean oil pumps in a new gasoline plant in Texas. Turbines have variable-speed governors and uncontrolled extraction.



Close-up of the rugged and reliable Elliott Type JR turbine driving a small pump. Sturdy design and minimum first cost make this a popular choice for low hp requirements (up to 45 hp, 4000 rpm).

ELLIOTT TURBINES, from the smallest single-stage, to large multistage types, are busy serving refineries everywhere — standard single-stage turbines for most jobs, multistage turbines for larger sizes where economy is important, the JR for small sizes.

Your local Elliott Field Engineer can help you pick the type for your job. Check with him or write Elliott Company, Steam Turbine Division, Jeannette, Pa.

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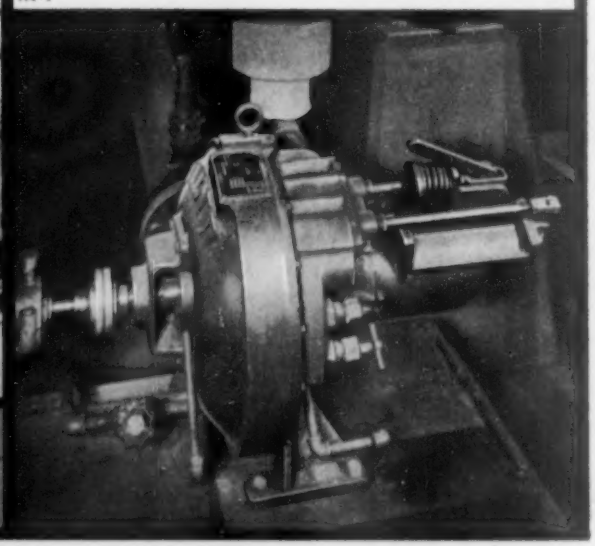


Crude Line Revived

South-central Alberta oil to be piped to Edmonton

CALGARY. — Rangeland Pipe Line Co., Ltd., is renewing its bid for a line to bring south-central Alberta crude northward to trunk lines running out of Edmonton.

Rangeland's application to link the Gilby, Sundre-Westward Ho, and Harmattan-Elkton producing areas to its existing facilities will be heard October 23 by the Petroleum and Natural Gas Conservation Board.

The company, a subsidiary of Hudson's Bay Oil & Gas Co., Ltd., proposes 46½ miles of 12-in. from Gilby field to Sundre field which is already served by the Cremona pipeline system. Rangeland would lay 4-in. gathering lines as needed.

The proposal is basically the same as one refused by the conservation board last March. Cremona won authority over competing applications of Rangeland and Pembina pipelines and laid a 68-mile, 8-in. line to Imperial Oil, Ltd., and British American Oil Co., Ltd., refiners at Calgary.

During its first 2 days of operation the first week of this month, Cremona picked up 2,000 and 5,669 bbl. of oil. Initial capacity of the line is 7,000 bbl. daily with ultimate capacity of 18,000 bbl. daily. Starting tariff is 30 cents per barrel compared to trucking rates of 58 cents from Sundre, 56 cents from Harmattan-Elkton, and 54½ cents from Westward Ho.

Sohio Plans Coke Outlet

CLEVELAND.—Standard Oil Co. (Ohio) has joined forces with Pittsburgh Consolidation Coal Co. to form a joint operation for calcining and marketing both companies' coke production.

The new Mountaineer Carbon Co. has begun construction of a calcining plant at Cresap, W. Va., 8 miles south of Moundsville. It will be capable of producing 165,000 tons of high grade carbon per year for use in making electrodes for the aluminum, electrometallurgical and chemical industries. It will be completed in January 1958.

Petroleum coke will come from Sohio's two delayed coking units at the Lima and Toledo refineries. They have a rated capacity for producing 320 and 180 tons per day, respectively. The plant will also take coke produced from the heaviest coal liquids made in Pitt-Consol's adjacent coal processing plant now building. The new company will also market green, uncalcined coke produced by both companies.

Processing BRIEFS

A catalytic desulfurization unit will be operating at Great Northern Oil Co.'s 25,000-bbl. refinery at Pine Bend, Minn., before the end of the year. A contract for engineering and construction of the $1,000,000 unit has been let to Fluor Corp., Ltd.

It will have a capacity of 5.2 million cubic feet daily and will remove sulfur compounds from a naphtha stream which feeds an existing ultraformer. The year-old refinery processes crude from Saskatchewan, with Fosterton field its primary source.

Ethyl Corp. will build a new tetraethyl lead plant in the San Francisco Bay area to serve expanding antiknock markets of the West Coast. This new installation will give Ethyl four manufacturing centers in the U. S. in addition to the one recently completed at Sarnia, Ontario.

Antiknock compounds are now produced in Baton Rouge and Houston. A new plant site near Joliet, Ill., was announced in May.

Standard Oil Co. (Ind.) will spend an estimated $8 million expanding its relatively new research facilities at Whiting, Ind.

Included is a new pilot-plant building which will house units up to 60 ft. high. A four-story technical service laboratory, an office building, and two single-story lab buildings for oil inspection operations and engine testing will complete the new buildings. The expansion will be completed in about 2 years.

The new buildings are needed to house Indiana Standard's expanded research staff at Whiting. The staff has been increased from 500 in 1946 to 1,200 today.

Sunray Mid-Continent Oil Co. has shut down its 2,000-M.c.f. daily natural-gasoline plant at Drumright, Okla., because of declining gas production in the area. Company also has sold its 4,000-M.c.f. daily gasoline plant near Cromwell to Redco, Inc., of Breckenridge, Tex., which will operate it in conjunction with a plant of 6,000 M.c.f. daily purchased recently from Carter Oil Co. Sinclair Oil & Gas Co. has bought about 80 miles of gathering lines which served the Drumright plant and is connecting the system into its 155,000-gal. plant in the same area.

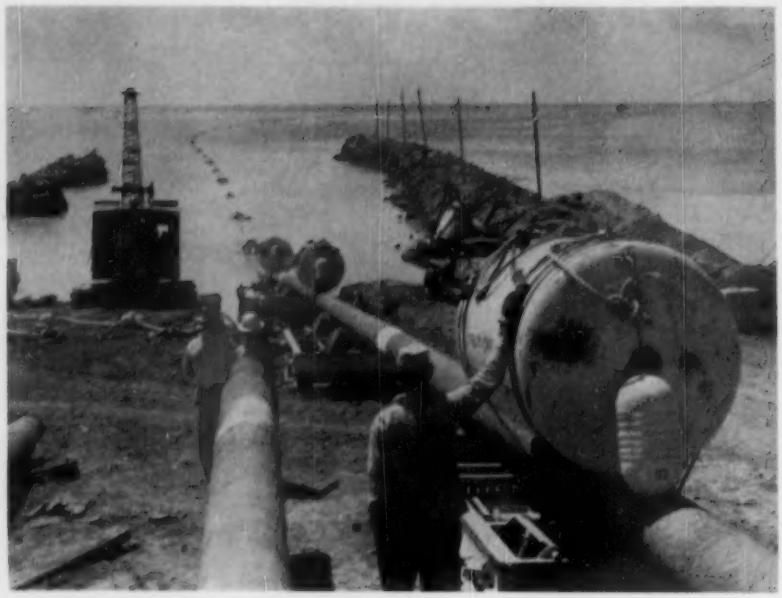
Latest boost in synthetic-rubber capacity is now under way by American Synthetic Rubber Co. It is spending $3 million to expand its Louisville, Ky., plant. Capacity will be increased from 44,000 to 68,500 long tons of GR-S by completion of the project in January 1957. Walter Kiddle Constructors, Inc., has the construction contract.

A new cylinder lubricant for large, low-speed marine diesel engines using residual fuels has been announced by Esso Research & Engineering Co. Named "TRO-MAR DX-130," the new product will reduce piston and liner wear up to 90 per cent, said Esso Research. It is radically different from conventional cylinder oils because it has a grease-like structure. It is now available in most world ports through affiliates of Standard Oil Co. (N. J.)

Also for Refiners . . .

Natural gasoline from one cycling plant is being converted to a blending component for another cycling plant 5 miles away (P. 86) . . . Mobilization Director Flemming is expected to reveal a new imports formula this week that will limit imports to about 10 per cent of refinery runs . . . Edmonton company is studying plans to build a 3,000-bbl. refinery at Haines, Alaska . . . Construction will start soon on shale-oil pilot plant (P. 88) . . . Du Pont is switching from coal to gas at West Virginia ammonia plant (P. 89) . . . Brazil is seeking an American builder for a 90,000-bbl. refinery planned near Rio de Janeiro (P. 91) . . . O.C.A.W. will open its campaign for 1957 wage increases in December . . . Pure faces strike threat at Smiths Bluff refinery (P. 94) . . . Cosden will use three 200-ft. towers as a single distillation train at Big Spring styrene plant (P. 96) . . . Gulf and union cleared of racial discrimination at Port Arthur refinery . . . Sinclair and Skelly open gas-products plant serving Hulldale field near Eldorado, Tex. (P. 101) . . . Southland maps expansion at Memphis; steel strike delaying Florida plans (P. 102) . . . Agreement nears on jet-fuel specifications, but minor changes are expected (P. 103) . . . B.P. will use Phillips low-pressure process at polyethylene plant scheduled near Grangemouth, Scotland (P. 105).

PLUS THESE TECHNICAL FEATURES: How to prolong equipment life (P. 132) . . . Determining hydrogen content in a hurry with radioactive isotopes (P. 133) . . . Cathodic protection at Cities Service's Lake Charles refinery (P. 138) . . . Prices of pipe and tubing in refineries (P. 147) . . . Advantages of special vessels (P. 148) . . . and separating propanes and butanes (P. 149).



Long Pipe String Launched . . .

. . . Spans Bay in Record Time

CORPUS CHRISTI, Tex. — Collins Construction Co. claims a world record in laying underwater pipeline with a new "flotation inversion" method.

A new rubber-tired launchway permitted the contractors to lay the 10-in. concrete-coated pipe in 4,000-ft. sections. Tug boats moving at an average speed of nearly 3 m.p.h. towed the sections into place across Corpus Christi Bay. Collins said the 60,000-ft. crossing was made in five 16-hour days, or a total of 80 hours, beating a 1953 record in which a 55,000-ft. crossing was made in 336 hours.

The record crossing represented the major part of a job recently completed for Reynolds Metals Co., by the Port Lavaca, Tex., contractor. The line will link Reynolds' La Quinta plant, near Corpus Christi, with the Flour Bluff plant across Corpus Christi and Oso bays.

The new construction method was conceived several years ago by S. V. (Sammy) Collins, of Collins Construction, but had never been thoroughly tested before. The innovation, according to company officials, results in a much faster pipe movement, quicker lineup, and safe tie-ins under adverse weather conditions.

How method works . . . A crew of 12 welders joined the 10-in. pipe in sections on the north side of Corpus Christi Bay, where the 4,000-ft. rubber-tired launchway was set up.

After each of the sections was made up, the first 4,000-ft. section was cradled on the launchway. At the end of the launchway, Collins set up its "Monkey Motion," a self-stabilizing unit designed to compensate for the different levels of the land and bay.

As the first section of pipe was towed to its position across the bay another string was lifted to the launchway. Following sections had progressively shorter distances to travel, since the first string was laid on the far side of the bay.

Collins said each 4,000-ft. section of pipe was launched at a speed of 240 ft. per minute. The team averaged laying about 12,000 ft. per day during the 5-day crossing.

Average time spent in making a tie-in was 3 hours. Four barge-mounted side-boom units were used in lining up the pipe and tieing in operations.

The entire line is to be buried 5 ft. below the surface after completion of the 2½-mile section across Oso Bay.

Each weld was examined by X-ray, with the mobile inspection department making an average of 130 circumferential X-rays per day.

Doping, wrapping, and concrete-coating of the pipe were done by Rosson-Richards, Corpus Christi. Jess Edwards, also of Corpus Christi, subcontracted the stringing of pipe along the launchway. Pipeline Technologists, Houston, was responsible for the design, engineering, and inspection.

Triple Completion in Kansas

LIBERAL, Kans. — Carter Oil Co. has made a triple completion of an oil and gas well in Kansas—the first for the state.

Carter reported the successful completion of its Cyr-Trust unit in Taloga field of Morton County resulted in gas production from the upper Morrow at 4,230-50 ft. and the Topeka at 2,914-3,096 ft.; and oil from the basal Morrow zone at 4,562-75 ft. Total depth of the well was 4,700 ft.

A 17-hour test swabbed 167 bbl. of

41.5°-gravity oil for a flow of 9.8 bbl. an hour. Tests of the two gas zones showed combined production of 9,500,000 cu. ft. on a 10-hour blowdown gage.

Line Awards Made

Northern Natural to bring service to 28 more cities

OMAHA.—R. H. Fulton & Co. has the contract to build a 164-mile extension of Northern Natural Gas Co.'s pipeline system from Sioux Falls to Aberdeen, S. D.

The extension includes 11.7 miles of 16-in., 82.3 miles of 12-in., and 71 miles of 10-in. Troth Construction Co. will lay 160.5 miles of branch lines in South Dakota and Underground Constructors, Inc., has the contract for 8.75 miles in Iowa. The lines will extend service to 28 new communities, most of which will be tied in this fall.

R. H. Fulton started last summer on 15.5 miles of 24-in. and 6 miles of 30-in. loops on Northern Natural's main line plus 28 miles of 20-in. from Ogden, Iowa, compressor station to the Redfield, Iowa, underground storage reservoir. The latter project will permit testing of the reservoir.

An additional 18,640 hp. in compressor capacity is being installed by H. B. Zachry Co., Dresser Engineering Co., and Foor Engineering Co.

The expansion, approved by the Federal Power Commission September 7, will enable Northern Natural to raise capacity by 69,000,000 cu. ft. to 1,195,661,000 cu. ft. daily. The system will serve 377 towns and cities in Minnesota, Iowa, Nebraska, South Dakota, and Kansas.

Gulf Cleared in Racial Case

BEAUMONT.—Gulf Oil Corp. and a union local have been cleared of a charge of conspiring to restrict job opportunities for Negroes working at Gulf's Port Arthur, Tex., refinery.

The $150,000 damage suit was filed by two Negro employes of the refinery and a Negro local of the old Oil Workers International Union. Named as co-defendants with Gulf were the O.W.I.U. local representing white employes and E. R. McAdams, former chairman of the workmen's committee.

Plaintiffs charged conspiracy in a 1954 contract between the company and Local 23 of the union. Charges involved the alleged restriction of Negro workers to the refinery's labor division.

The verdict upholding the bargaining procedure was reached by a U. S. District Court jury here after less than an hour of deliberation.

Gas-Products Plant Completed in Texas

TULSA.—Sinclair Oil & Gas Co. and Skelly Oil Co. have started up a new gas-products plant serving Hulldale field 12 miles northeast of Eldorado in Schleicher County, Texas.

Sinclair will operate the plant which initially will recover 1,600,000 gal. of natural gasoline, butane, and propane per month from 140,000,000 cu. ft. of natural gas. Delta Engineering Co., Houston, was the contractor. A near-by pipeline will purchase natural-gasoline production. L.P.G. will be marketed by truck and railroad car. Negotiations for marketing residue gas are in progress.

Two tries at building a cooperative plant for conservation of oil-well gas failed, Sinclair said. One problem was lack of a market for the dry gas. The plant will be expanded as needed to handle gas produced with oil.

Lease-Bond Procedure Changed

WASHINGTON.—The Interior Department last week wiped out the open-end provision in blanket bonds on oil and gas leases.

A new regulation voids a blanket bond after payment of any claims resulting from default, damage, or other causes on a lease. In such cases, the lessee must post a new bond within 6 months after notice.

Previously, blanket bonds remained in full force following payment of claims. No deduction was made for the payment. This open-end provision made it difficult for smaller companies to obtain blanket bonds. They often had to furnish separate bonds for each lease.

The departmental regulations permit a company holding federal leases on public or acquired lands to submit either a separate indemnity bond of $5,000 for each lease or blanket bonds of $25,000 or $150,000-denominations to cover a number of leases.

Individual bonds of $15,000 are required for exploration in any one of the three geographical areas on the outer Continental Shelf (Gulf of Mexico, Pacific Coast, and Atlantic Coast). A blanket bond of $100,000 may be posted to cover multiple-lease operations in all three areas.

Ute Lands Bring Record Bids

IGNACIO, Colo.—A record $7,607,891 has been paid for oil and gas leases on 53,120 acres of Ute Indian tribal land in the Four Corners area of southwestern Colorado and northern New Mexico.

The California Co. paid a record bonus of $601 an acre totaling $1,538,560 for a 10-year lease on 2,560 acres in the heart of the Four Corners area. The firm also bid $526 an acre on another tract for the second highest bonus offering. Highest previous bonus for Ute tribal land was $216 paid by Stanolind Oil & Gas Co. in 1954.

Ten different companies were granted leases on the 21 tracts offered. Recent development of Aneth oil field sparked interest in the acreage.

Southland Expanding

Capacity of Memphis refinery will be more than tripled, steel strike delays plans for 15,000-bbl. Florida plant

MEMPHIS, Tenn. — Southland Co. will start work within the next 2 to 3 weeks on an expansion and modernization program which eventually will more than triple the size of its recently purchased 6,000-bbl. refinery here.

Southland bought the Memphis plant from Delta Refining Co. in June. The expansion will be in two stages—12,000 bbl. daily by February 1957 and to about 22,000 bbl. daily by October 1957.

The plant currently has a 6,000-bbl. unit, a 1,000-bbl. vacuum distillation unit, a 3,100-bbl. Thermofor catalytic cracker, and a 250-bbl. catalytic polymerization unit.

The construction calls for expanding capacity of the crude unit to 22,000 bbl. through modifications, installation of a larger kiln for the cracker to hike its capacity, and the building of a new alkylation unit.

E. Constantin, Jr., president and general manager of Southland, said the crude-unit revamping would include: Combining some of the heaters and adding a new one, expanding cooling and heat-exchanger sections, and adding a boiler and a new tower.

Most of the alkylate will be blended into motor gasoline to produce a competitive high-octane product. Some may go into aviation gasoline. Other products will include jet fuel, asphalt, commercial solvents, naphtha, and propane.

Shot in the arm . . . The Memphis plant, Constantin said, will fit neatly into Southland's refining and marketing setup. High-octane motor gasoline which the plant will produce on completion of the expansion program will give the company a needed lift.

Southland now has 20 of its own service stations, plus another 50 to 60 controlled outlets in northern Mississippi. In June, the firm revealed construction was under way on 40 new stations.

Southland's other two refineries in Mississippi, which primarily are asphalt plants, were unable to supply these outlets with motor gasoline of sufficiently high-octane rating. They were too small and unsuitable in other ways to be considered for an expensive overhaul.

The plant at Memphis is just north of the Mississippi state line. And product transport costs from the refinery to marketing outlets will be small.

The Southland refineries in Mississippi are at Yazoo City, which is company headquarters, and at Sandersville.

The Yazoo plant has a capacity of 5,500 bbl. daily and produces 2,000 bbl. of straightrun asphalt daily. The Sandersville installation, rated at 5,600 bbl. daily, has thermal operations totaling 1,600 bbl. daily and polymerization capacity of 90 bbl. daily.

Florida plant planned . . . An affiliated company, Southland Oil Co. (Fla.) also headed by Constantin, is completing plans for an all-new 15,000-bbl. refinery near Black Point, just southeast of Tampa, Fla.

Lack of steel, among other things, has held up construction. The design-engineering contract has not been let.

Union Hits in Kern

Deep California discovery flowed 2,000 bbl. initially

BAKERSFIELD.—Union Oil Co. of California has given the 23-year-old Mountain View field in southern Kern County a new deep pool discovery of major importance.

The discovery well, 1 Stenderup, was completed as a Derby pool find in the interval 9,535-9,717 ft. It initially flowed 2,000 bbl. daily. Since completion, the well has been choked back and is presently flowing 1,170 bbl. daily of 27.4°-gravity crude and 800 M.c.f. of gas through a 44/64-in. choke. The new pay is between the Santa Margarita and Vedder zones in upper Miocene. Total depth of the test is 12,514 ft.

Union, with a 75 per cent interest, is acting as operator on a 4,450-acre block surrounding the discovery held jointly with Hancock Oil Co. The new find is located 1 mile west of production in the Arvin area of the Mountain View field.

Tidelands Settlement Fought

LONG BEACH.—Attorney Theodore Gabrielson has asked the California Supreme Court to set aside a compromise settlement in a fight between Long Beach and the state over $170 million in impounded tidelands oil revenue.

Superior Court Judge Curtis Scott last month approved the settlement. It called for Long Beach to pay the state $120 million. In addition all future oil revenue will be split between the two after deducting funds to pay for subsidence work in the city's harbor area *(The Oil and Gas Journal, September 17, page 127)*. The state will get all dry-gas revenue.

The compromise followed a court decision last year in the Mallon case that funds freed by the state legislature from terms of a 1911 grant to the city should go to the state and not Long Beach. The state then filed suit to recover the funds being held by the city, but the compromise was reached before the suit went to trial.

Gabrielson represented Felix Mallon in the original taxpayer's suit which eventually resulted in the $120 million windfall to the state. He is claiming a $6 million fee for his work in the case.

Gulf Changes Tanker Colors

NEW YORK.—Gulf Oil Corp.'s tanker fleet of 27 vessels is getting a face lifting that will break three traditions of more than 50 years standing.

Gulf's fleet, totaling 436,356 deadweight tons of ocean-going tanker bottoms, is discarding its traditional colors of black and buff for a sprightlier and more pleasing blue-gray and white combination.

At the same time the company is discarding the white "G" on the red field that has always appeared on the stacks of its vessels and on its marine house flag. This will be replaced by the well-known "Gulf" orange disk on a blue field.

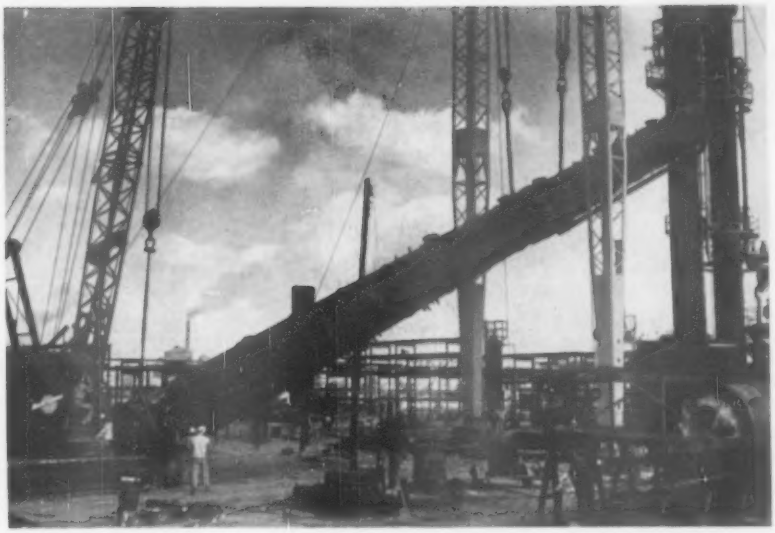
Carl F. Vander Clute, general manager of Gulf's marine department, said last week the repainting will be done as rapidly as operating conditions permit.

Kansas Flood Job Starts

BARTLESVILLE, Okla.—Cities Service Oil Co. will start initial work immediately in water flooding the 2,400-acre Bartholomew pool unit in Sedgwick and Kingman counties, Kansas.

Engineers report the Mississippian limestone pool has produced about 2,300,000 bbl. of oil by primary methods. About 250,000 bbl. are believed left to be recovered by this method. It is estimated that 2,800,000 bbl. of additional oil can be produced through water flooding. Initial phase of the program will cover injection of water into the 3,800-ft. formation through four input wells. Ultimately about 40 new wells will be drilled in the field.

The pool is 27 miles west of Wichita, Kans. The unit has 22 working interests with Cities Service designated as operator.



Big Tower Eased into Position

HOUSTON.—A giant winch has just completed the delicate task of erecting a 126-ft. fractionation tower among other processing units at the Houston refinery of Eastern States Petroleum Co., Inc.

The tower will increase production of petroleum solvents for Eastern States Chemical Corp., a subsidiary of Eastern States Petroleum. Brown & Root, Inc., used two 150-ton-capacity poles with a 125-hp. electrical winch to hoist the tower. The 108-ton tower, measuring 7 ft. in diameter, is shown being inched into place. A speed crane rigged on the rear of the tower stabilized the unit.

For the nation's airlines . . .

. . . Jet-Fuel Accord Is Near

NEW YORK.—The confusing picture on jet fuels for the airlines is beginning to come into focus.

Latest indications are that straight JP-4 will not be accepted as one of the alternate fuels without some modifications. The kerosine type attracting most interest will have restrictions on freeze point, pour point, and thermal stability. Otherwise, few changes from the original specifications are expected.

All parties concerned with setting specifications on the two fuels are now believed nearing agreement, although a minority is still dissatisfied with some points. At the recent West Coast meeting of American Society for Testing Materials most of these differences were resolved and the society's technical committee "J" on aviation fuels drew up proposed specifications for the two fuel types.

These specs are now out on a letter ballot to committee members. On the results of this ballot, committee "J" will make its recommendations to the parent committee D-2, probably at the latter's meeting in New Orleans in February. Committee D-2 will in turn ballot its membership and make a final recommendation to the A.S.T.M. at the annual meeting in June. At that time, final approval is expected, and the two fuel specifications will become official.

Minor changes . . . At the present stage, the kerosine-type fuel shows few changes from the proposed fuel previously considered *(The Oil and Gas Journal, September 17, 1956, page 118).*

Called "Turbine Fuel A," it incorporates a limitation on thermal stability. Until a standard test is developed by A.S.T.M., the test method of the C.F.R. Thermal Stability Group using the Erdco Coker will be used. The kerosine fuel must show a pressure drop of no more than 12 in. of Hg at the standard conditions; 5 hours operation at 6 lb. per hour fuel flow, 300° F. fuel temperature, and 400° F. filter temperature. The preheater tube must rate "light stain" or better.

Gravity range is set at 39°-51° A.P.I. with heat content at 121,500-126,500 B.t.u. per gal. and a minimum of 18,400 B.t.u. per lb. Maximum allowable sulfur was raised from 0.25 to 0.30, but mercaptan sulfur was set at 0.003, all in weight per cent. To the minus 40° F. freezing point is added a minus 40° F. pour point, pending the development of a low-temperature flow test.

Sulfur restricted . . . The standard JP-4 came in for some modifications in the specs which are now under consideration.

Labeled "Turbine Fuel B," this grade shows greater restriction on sulfur and mercaptan content, some easing on freezing point and the addition of a thermal stability requirement.

Maximum total sulfur is reduced from 0.4 to 0.3 weight per cent, and mercaptan sulfur is dropped from 0.005 to 0.003 weight per cent. The minus 75° F. freezing point is changed to minus 60° F. and a 3-lb. maximum on Reid vapor pressure replaces the JP-4 range of 2-3 lb. A thermal stability limit of 12 in. of mercury is placed on the commercial fuel vs. none in JP-4.

On heat content, the members are being asked to vote on 117,500-122,500 B.t.u. per gal., 18,400 minimum B.t.u. per lb. or an aniline gravity product of 5,250. Some controversy remains over aromatics content. This is set at 23.0 volume per cent, although some members still want a 20 per cent maximum.

Some opposition . . . These tentative requirements do not represent a complete meeting of minds.

Some representatives of the oil industry would like to see JP-4 accepted as is, with broad restrictions placed on both types. The cost of meeting some restrictions has served to modify the desires of some representing the airlines and engine manufacturers.

It is still too early to assume that the proposed specifications now under consideration will carry through to become official, but changes are expected to be few and minor.

Humble Wins Patent Suit

BEAUMONT.—U. S. District Judge Lamar Cecil ruled against Kinnear-Weed Corp., Beaumont, in a $255,814,800 patent suit against Humble Oil & Refining Co.

The plaintiff alleged that Humble had infringed patents on jet-type drill bits invented by C. W. Kinnear, Houston, president of Kinnear-Weed. The oil company contended it had developed the technique of jet drilling in a research program started in 1943.

In his ruling Judge Cecil held that the plaintiff was entitled to no damages. The Beaumont company also has patent suits against several manufacturing companies pending in U. S. District Court in Houston.

Lebanon Faces Shutdown

I.P.C. takes the offensive in pipeline battle, fires 120 workers and takes its story before world public opinion

IRAQ PETROLEUM CO., Ltd., has taken the offensive in its pipeline dispute with Lebanon. It is showing the Lebanese Government it means business in bypassing the country and is taking its side of the disagreement before world public opinion.

The company's tough tone toward Lebanon followed its decision to route a 24-in. loop in its pipeline system to Banias, Syria, instead of Tripoli, Lebanon *(The Oil and Gas Journal, October 8, page 129)*.

Since then, I.P.C. quickly:

. . . Bought advertisements in leading newspapers throughout the world to publish a strongly phrased, 1,500-word statement explaining its troubles with Lebanon.

. . . Fired 120 Lebanese workers "with greatest regret" and hinted that many hundred more may be left unemployed if operations shut down in the country.

Shutdown looms . . . I.P.C. predicted a cut in operations "if the present policy of the Lebanese Government toward the company is continued."

The company warned if extreme government measures are carried out, the result would be suspension of operations and the mass discharge of 2,500 employes.

I.P.C. expressed goodwill toward the Lebanese people and said it desired to settle the difficulties. It added: "But these results cannot be achieved in an atmosphere of misrepresentation and threats, which are incompatible with the position of Lebanon as one of the most important commercial centers of the Middle East. . ."

The company explained that the 120 workers actually discharged were surplus hands kept on the payroll in hopes they would be used for expanded operations the company was forced to abandon.

Lebanese political leaders reportedly feared such a move. It indicated I.P.C. meant business in shifting the pipeline loop to Syria. Also, it pointed the way to further economic losses. Lebanon would lose about $2,240,000 annually in revenue from the new line. Other possible losses include the increased employment and expenditures that would have accompanied the project.

Time vital . . . In giving its side of the story, I.P.C. indicated that it could no longer wait for an agreement with Lebanon without delaying the project a year.

This was because a section of the line lies in Bekaa Valley near the Syrian-Lebanese border. Most of the year the area is under rice cultivation. Work on the line must be done after the September harvest and before the winter rains.

I.P.C. had offered to share 50-50 with the government profits of its transit operations in the country. This would amount to $1,960,000 yearly on present throughput of 150,000 bbl. daily. The loop would have meant an additional throughput of 180,000 bbl. daily, and brought total revenues to $4,200,000 annually.

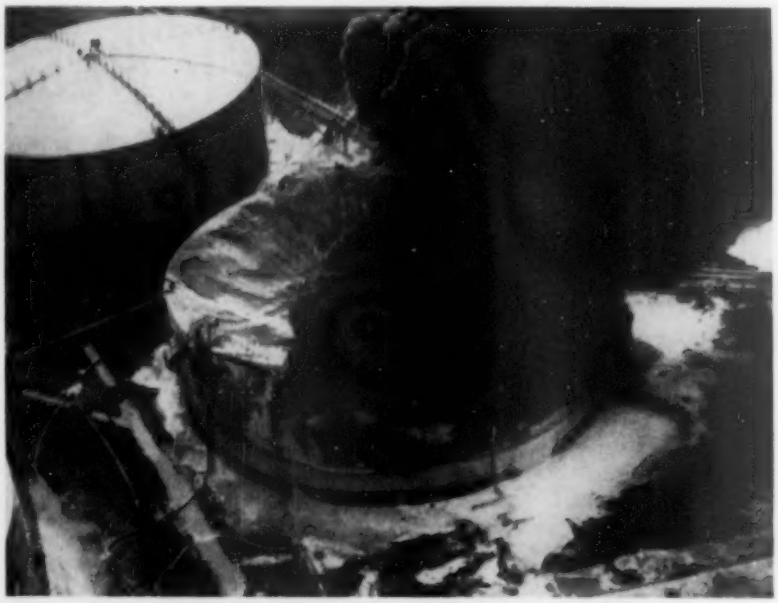
The government held out for payments comparable to those made to Syria, where the company's operations are much more extensive. I.P.C. contended that higher payments would be uneconomic, and result in higher-priced crude at Tripoli that would not find buyers.

The company said that it had earlier notified the government that because of financial and technical factors, a decision on the pipeline route was necessary by June 15. When an agreement was not reached by that time, the company said it readjusted its engineering program to permit a delay until October 1.

The government broke off negotiations in June. They have not resumed. Lebanon also passed a law retroactive to 1952 which would make the company liable to internal income taxes.

Refinery losing money . . . I.P.C. also complained that the government has failed to ease conditions under which 11,550-bbl. Tripoli refinery operates.

The company said that retail prices of products have been frozen since September 1950. It added that it has been obliged to run the refinery at an annual loss of about $925,000 for several years.



Firemen Battle English Refinery Blaze

FIRE destroyed about 15,000 bbl. of gasoline at the Shell Haven refinery in Sussex, England, of Shell Refining & Marketing, Ltd. Firemen from London, about 40 miles from the scene, were called in to assist Essex firemen and the refinery's own fire-fighting companies in bringing the flames under control.

The fire was confined to the one storage tank of the 70,000-bbl. refinery.

B.P. Bids for Trinidad

British Petroleum thwarts Colorado Oil & Gas plan for buying Trinidad Petroleum with sudden cash-stock offer

BRITISH PETROLEUM CO., LTD., 51 per cent controlled by the British Government, stepped in last week in a surprise move that will prevent a second American firm from buying into Trinidad's oil industry.

B.P. made a cash-and-stock offer which amounts to about $26,800,000 for all the stock of Trinidad Petroleum Development Co.

The move came a short time after Great Britain's treasury officials refused to approve a stock-exchange offer for the same company made by Colorado Oil & Gas Corp. The Colorado firm was expected to make a cash offer for the Trinidad company after its stock offer got the British Government's frown of disapproval *(The Oil and Gas Journal, September 24, page 105, and October 1, page 71).*

British Petroleum's offer, which is almost certain to be accepted all around, was in two forms. B.P. made a cash offer equivalent to $6.65 a share for the half interest in Trinidad Petroleum which is owned by British-Controlled Oilfields, Ltd. B.C.O. is a Canadian firm now in the process of liquidation. It holds 2,000,000 shares of the Trinidad company.

B.P. offered one share of its common stock for every three of T.P.D. held by the public. Trinidad Petroleum Development's directors have already agreed to recommend to stockholders that the offer be accepted.

What B.P. will get . . . Trinidad Petroleum Development has a daily oil production of about 10,000 bbl. on slightly less than 74,000 acres on the Caribbean island colony.

Probably more important in the long-range picture is the total of 225,000 acres of offshore concessions which T.P.D. holds in the Gulf of Paria and along the southern coast of Trinidad in the waters dividing the island from Venezuela.

British Petroleum already owns a one-third interest in Trinidad Northern Areas, Ltd., which has done the island's first successful offshore exploratory drilling. T.N.A. is drilling a second deviated well from a platform in the Gulf of Paria in the new Soldado field, about 14 miles from Point Fortin Jetty lights in the gulf.

Blocks of T.N.A. offshore acreage adjoin that held by Trinidad Petroleum Development in both the Gulf of Paria and the areas off Trinidad's southwest coast.

B.P.'s two partners in Trinidad Northern Areas are Shell Trinidad, (formerly United British Oilfields of Trinidad), and Trinidad Oil Co., which was purchased outright for $176 million by The Texas Co. in September.

B.P. Plans Plant

Phillips process is basis for Grangemouth facility

ANOTHER polyethylene plant will be built at the fast-growing petrochemical center near Grangemouth, Scotland.

British Hydrocarbon Chemicals, Ltd., is designing a plant to produce 25,000,000 lb. per year of the versatile plastic. The company is jointly owned by Distillers Co., Ltd., and British Petroleum Co., Ltd., which operates the 50,000-bbl. refinery at Grangemouth.

B. P. Chemicals already produces synthetic ethyl alcohol and is building ethylene, ethanol, and tetramer facilities to go on stream next year. Other B. P. affiliates manufacture monomeric styrene and detergent alkylates.

Union Carbide & Carbon Corp. is building a polyethylene plant which will use ethylene produced by B. P. Chemicals. A butadiene plant also is slated for Grangemouth.

Phillips licenses plant . . . The new polyethylene plant will be based on the new low-pressure, catalytic process for polyolefin plastics licensed by Phillips Petroleum Co.

B. P. Chemicals will be the sixth foreign firm to erect a plant using the Phillips process. Phillips also has licensed it to four U. S. chemical companies, and is constructing its own plant at the Adams Terminal chemical-manufacturing site on the Houston Ship Channel. Capacity will be 110,000,000 lb. per year.

Panama Acreage Selected

International Oil & Metals Corp., Los Angeles, has completed a stratigraphic test in Panama and has selected 1,165,000 acres in 48 blocks for further exploration.

The company recently acquired 75 per cent interest in a 10,000,000-acre concession from Cia. Petrolera del Golfo del Darien, an affiliate of Commerce Corp. of New York. Selection of the acreage, located in Darien Province near the Colombian border, was based on geological surveys and information from the 1,641-ft. stratigraphic hole.

France Hits Again

Esso Standard gets a new strike near Parentis field

ESSO STANDARD, S.A.F., has brought in another discovery near Parentis field in southwestern France.

The Standard Oil Co. (N. J.) affiliate cored 6½ ft. of oil saturated lower Cretaceous limestone in Lucats 1, located less than 4½ miles southeast of Parentis 1. Top of the limestone was encountered at 6,750 ft.

Last week the company was setting casing, after which it planned tests.

Three years ago the first Parentis well found the best field in Western Europe. The field currently has 18 wells on production. Twelve flowing from dolomite average about 1,500 bbl. daily each. Six are on pump, averaging 200 bbl. daily from limestone.

Late in August, Lugos 1, located 13½ miles northeast of Parentis, was completed as a producer. It is on pump with an output of 350 bbl. daily.

A well at Mothes, 9 miles east of Parentis, is producing 330 bbl. daily on pump. Four offsets were dry holes.

Output in Israel to Rise

The joint operators of Israel's Heletz field expect to raise production to 4,200 bbl. daily by the end of next year.

Lapidoth Israel Oil Co., Ltd., and Israel Oil Prospectors, Ltd., currently produce about 600 bbl. daily from five wells, each with an output of from 105 to 135 bbl. daily.

Algeria Permit Sought

The joint French-Algerian company which recently made a discovery in the east-central Sahara region of Algeria has applied for an exploration permit over a 1,300-sq.-mile area southeast of the wildcat location.

The request, made by Ste. Nationale de Recherche et D'Exploitation des Petroles en Algerie (SN REPAL), covers the only open acreage in that region of Algeria.

The discovery was made in a deep test 63 miles southwest of Ouargla.

Another company, Cie. Francaise des Petroles (Algerie), also applied for a permit on nearly 8,000 sq. miles in southern Algeria.

GEOPHYSICIST poking around in the village square means . . .

Wildcat Comes to Zanzibar

BRITISH PETROLEUM CO., LTD., and Royal Dutch-Shell are getting well along with their second deep test in a joint exploration program on the East Coast of Africa.

The Zanzibar Island test of BP Shell Petroleum Development Co. of Tanganyika is now past 7,000 ft. It was started in May after 18 months of intensive geological and geophysical surveying. Projected depth of the wildcat is 12,000 ft.

The geophysicist taking a gravity meter reading in a village square of Zanzibar (see photo) is typical of now familiar sights on the island. Exploration work in the general region began in 1951.

The first test was drilled on Mafia Island to the south. It was completed early this year at 11,051 ft. The well was a dry hole, but it yielded valuable information in an untried country.

Among the supplies which the company plans to bring in by ship for the single Zanzibar test are: 200,000 gal. of fuel, 700 tons of cement, 24,000 ft. of casing, and 1,500 tons of mud.

Concessions Sought Off Kuwait

PLANS of Kuwait to offer offshore concessions in the Persian Gulf appeared to be shaping up last week, some 9 months after the Shaikh of Kuwait first voiced his intentions.

Reports from London indicated that the Royal Dutch-Shell group and several others described as "American independents" are interested.

E. W. Pauley, California independent operator, was reported in Kuwait last week negotiating for a concession.

Two of the world's major oil companies are known to be very disinterested in Kuwait's offshore prospects. They are British Petroleum Co. and Gulf Oil Corp. The two are joint owners of Kuwait Oil Co., which holds the concession over the entire British protectorate of Kuwait. The little Middle East shaikhdom has more known oil reserves than any other nation in the world and is currently producing 1,175,000 bbl. of crude every day.

Kuwait Oil Co.'s concession covers all the land area of Kuwait and the region up to 6 miles offshore in the Persian Gulf.

Kuwait first announced it was preparing to offer the lands offshore early this year in announcements made by the shaikh's representative in London *(The Oil and Gas Journal, February 6, page 76).*

Before any firm concession to the Persian Gulf's underwater lands could be granted, opposing claims of the various governments bordering the gulf would have to be resolved and undefined boundaries firmly fixed.

Strike Has Trouble

Salt water plagues Union Oil's test in Costa Rica

SALT water for the second time has thwarted Union Oil Co.'s bid to complete Central America's first producer.

Union officials at the 2 Cocoles in Costa Rica said it was flowing 72 per cent salt water under extreme pressures. The flow is coming from around 5,000 ft. just below the 72-ft. oil zone rather than above it as had been hoped.

The well, located 16 miles inland from the Caribbean coast and less than a mile from the Panama border, tested up to 7,000 bbl. daily of 46°-gravity oil last month *(The Oil and Gas Journal, September 10, page 96).*

A. C. Rubel, president of Union, called it a "discovery of major importance." But near the end of tests, salt water began flowing. Because of the extreme pressure, Union said last week it was permitting the flow to continue.

The 1 Cocoles, Union's fourth Costa Rican test drilled nearby, encountered similar trouble. Salt water entered the hole when it was taken to 6,233 ft. after the operator found 114 ft. of saturated limestone at 5,450 ft.

Turkey to Be Tested

Gilliland wildcat is first started under new oil law

GILLILAND OIL CO., Los Angeles, has spudded a well on Iskenderun Bay—the first test to be drilled on concessions granted under Turkey's new oil law.

The well is being slant-drilled from shore to test an anticline that extends into the Mediterranean Sea. It is projected to between 3,500 and 4,000 ft. and will test the Pliocene, Miocene, and Eocene.

Prime Minister Adnan Menderes headed a large group of Turkish government officials and other dignitaries attending spudding-in ceremonies October 3. The test is in the Adana basin region southwest of Ankara.

Gilliland expects to drill a second wildcat next year on another acreage block on the Iraq border. Site for this test is about 30 miles from present production in Iraq.

American Overseas Petroleum, Ltd., a Caltex company, has staked a location 18 miles from Gaziantep in southern Turkey for a test it plans to start near the end of the year. Amoseas has a total of 718,607 acres under license in the country.

Vital link in the service chain

To serve the active drilling areas in the United States and Canada, Hughes today operates more than 150 strategically located field stockpoints. They represent another vital link in the Hughes service chain set up to assure the delivery of bits of the *right* size, type and design to your rig . . . *ahead of time.*

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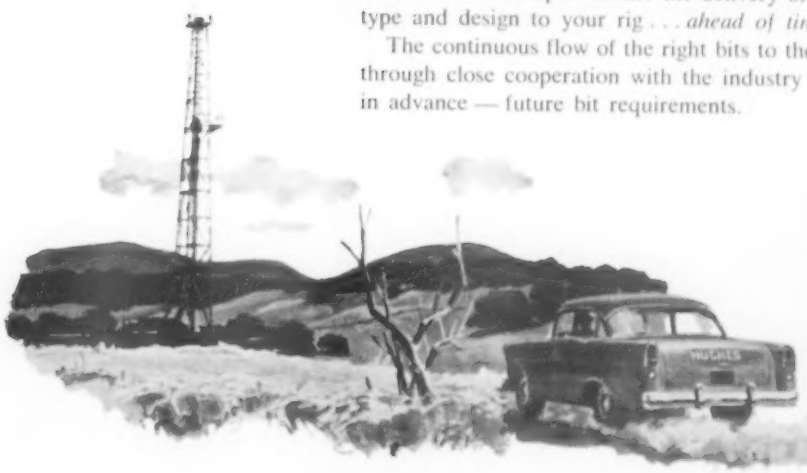

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We've learned from long experience in developing new bit designs that you can't rely on spot bit runs to tell how a bit will really perform. You can only be sure of *predictable* performance when results have been repeated and repeated. Not only in one field, but under comparable conditions in many different fields.

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Each year, hundreds of thousands of bit records and dulled bits are analyzed by Hughes engineers in evaluating design and metallurgical changes. This is another *big* reason why the performance of HUGHES rock bits is the *world standard of the industry!*

The Multispaced Neutron Log—It's a

New Nuclear Radiation Logging Method

. . . employing a pair of neutron curves

Multispaced neutron logs have been valuable in Venezuela in distinguishing between gas and oil zones. With proper interpretation this is only one of the several potential applications of this tool. Tests in other areas have been limited so that norms are yet to be established. Here is what the curves mean and how you should interpret them to get best results.

by Gilbert Swift* and Russell G. Norelius†

SUCCESSFUL tests of multispaced neutron logs in Venezuela in distinguishing between gas and oil zones has been aided by limited porosity variation in the formations. But the work in this area has shown that normally there is a certain fixed relationship between the ratio of the deflections of the two neutron curves. A large deviation of this ratio from the norm in the high deflection range will indicate gas or a dense formation.

Experience in this area should be valuable to interpretation of multispaced neutron logs in other areas. Certain theories suggest that a predominant relationship should exist between the intensities of radiation observed at different distances from a neutron source. Showing departures from this norm is the distinct advantage of the multispaced curves. This leads to positive identification of changes in and around the bore hole, which is a definite improvement over information available from only one neutron log.

*Well Surveys, Inc., Tulsa. †Petro-Tech Service Co., Caracas.

Conventional methods . . . In conventional radioactivity logging the gamma-ray curve, which responds to the natural radioactivity of the formations, is used to distinguish shales and shaly zones from the cleaner sandstones and limestones which constitute possible fluid-bearing zones. In these zones the neutron curve then serves to indicate the relative amount of fluid present.

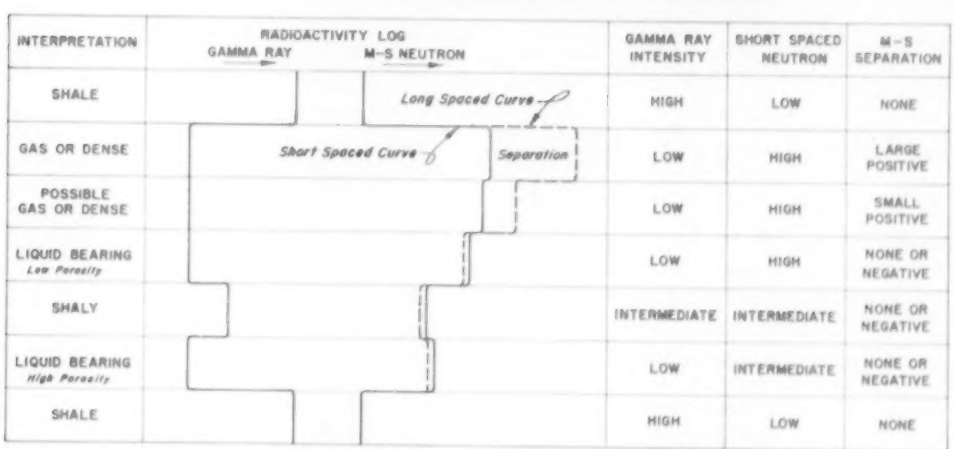
The possible fluid-bearing zones normally record at minimum intensity of the gamma-ray curve while shaly zones show a medium to high intensity value. On the neutron curve shales record at minimum intensity. Liquid-filled porosity is then indicated by a somewhat higher intensity on the neutron curve in combination with a low gamma-ray intensity, while absence of liquid or the presence of gas is ordinarily indicated by a still higher neutron intensity value.

Finding pore content . . . A major problem is that of determining the intensity boundary between commercially recoverable liquid on the one hand and dry, dense, or gas-bearing formations on the other. In certain cases this boundary may be established on a single neutron curve with relative ease, provided the interpreter is familiar with the area, its neutron curve responses, and its production characteristics. But, above all, the existence of a uniform relationship between neutron intensity and the formation properties is required.

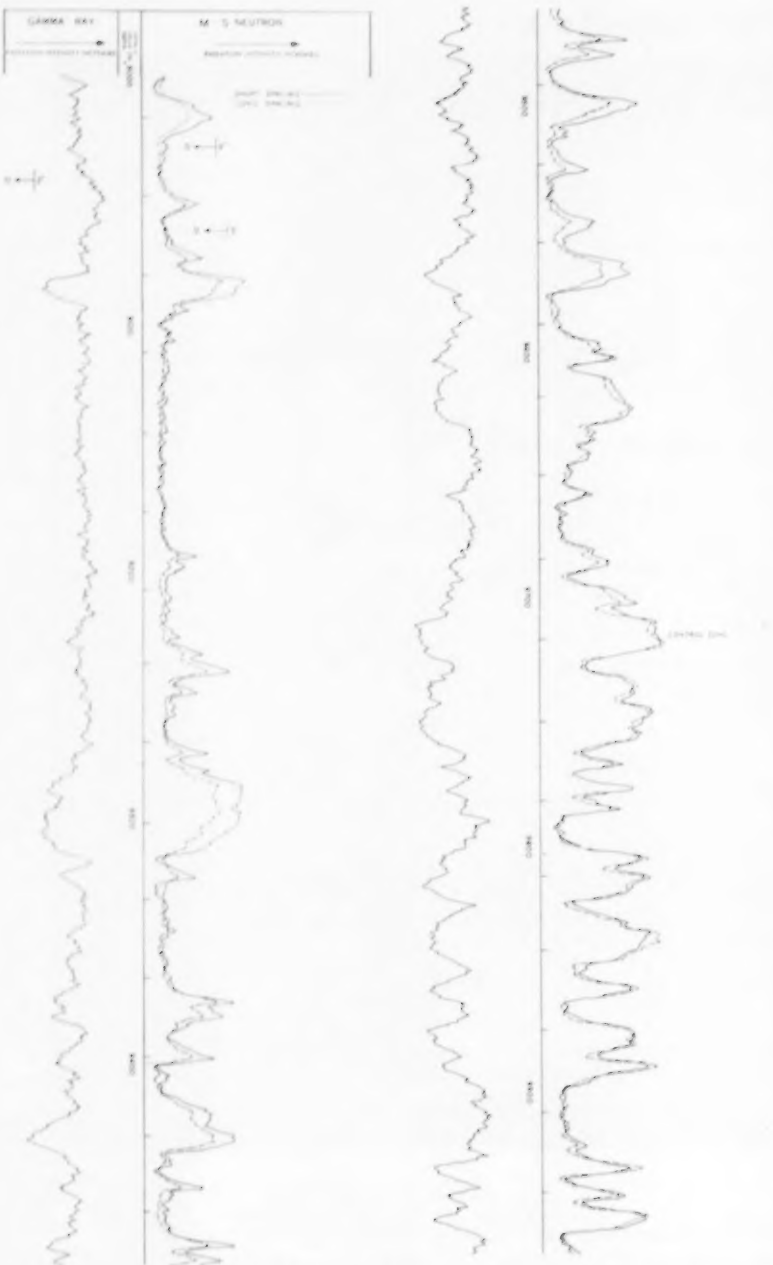
Where this exists it is usually not difficult to pick out with reasonable certainty one or more zones near the boundary between sufficient and insufficient liquid-filled porosity to produce liquid. Then the neutron curve can be divided by vertical lines into two or three intensity regions.

When accompanied by low-intensity values on the gamma-ray curve, neutron-curve intensities greater than (to the right of) these lines indicate gas-bearing or dense zones; intensities to the left of these lines indicate adequate liquid content; while zones which record on the line, or between the lines if two have been drawn, represent an unresolved condition. The greater the interpreter's experience, backed up with test data from the same formations in adjacent wells, the closer together he can place the lines, perhaps eliminating the doubtful zones entirely in many instances.

Spacing importance . . . The neutron curve shows a greater contrast between liquid-filled zones and gas-filled or dense zones when the spacing between the neutron source and the detector is lengthened. Conversely, the distinction is diminished by shortening the spacing. Thus, when employing a single neutron curve for this purpose, one should avoid the use of too short a spacing. However, as the spacing is increased the radiation received by the detector is substantially diminished and the



TYPICAL RESPONSE of the gamma-ray curve and the two differently spaced neutron curves provides the means to identify gas or dense zones. Fig. 1.



NORMALIZED CURVES have the same deflection over the full range for shaly or liquid-bearing formations such as in the interval up to 9,600 ft. The two neutron curves above 9,600 ft. appear to be unnormalized; the sensitivity and zero position of the long-spaced curve need to be changed. Fig. 2.

relative size of the inherent statistical fluctuations is correspondingly increased.

A compromise is therefore required between the limits of intolerably small distinction between gas and liquid on the one hand and intolerably great statistical error or intolerably slow logging on the other. Generally, the spacing employed for ordinary neutron logging in a given area is chosen on the basis of such a compromise. However, where distinction between various degrees of liquid-filled porosity is more important than the distinction between liquid and gas or between liquid and dense conditions, a somewhat shorter spacing is more suitable.

Multiple spacing . . . A new technique recently introduced shows promise of finding widespread application to the problem of distinguishing between liquid and gas-filled porosities and to certain other problems. This process is termed multispaced (M-S) neutron logging.

The complete M-S log comprises a gamma-ray curve together with two neutron curves, one of which is run with a relatively short source to detector spacing, the other at a spacing considerably greater. The relative deflection of these two neutron curves is used to differentiate between liquid-bearing zones and gas-bearing or dense zones. The two curves, when "normalized" (a term which will be explained subsequently), tend to coincide in zones of low and medium intensities. But the two curves separate from each other in certain other zones, the long-spaced curve deflecting much farther to the right than the short-spaced curve. The separation between the two curves is said to be positive when this occurs. Smaller negative separations are also observed.

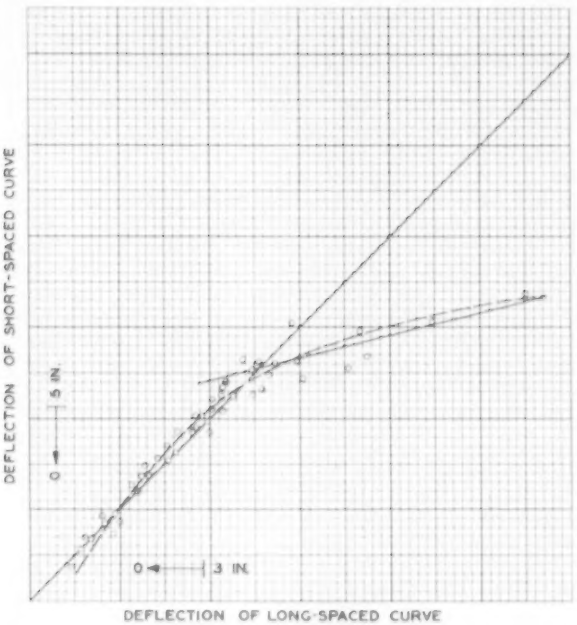
. . . Normalization represents the selection of the particular sensitivity and zero position required in the well or field to make the two curves of the M-S log coincide at two selected deflections. Ordinarily one of these corresponds to shale (the lowest recorded intensity) and the other is that corresponding to a known liquid-bearing zone of relatively low porosity. The particular zone chosen for this purpose is called the "control zone."

Normalization is not essential to the M-S log, nor to its interpretation, but it serves to unify the appearance of M-S logs and to simplify their immediate analysis and use.

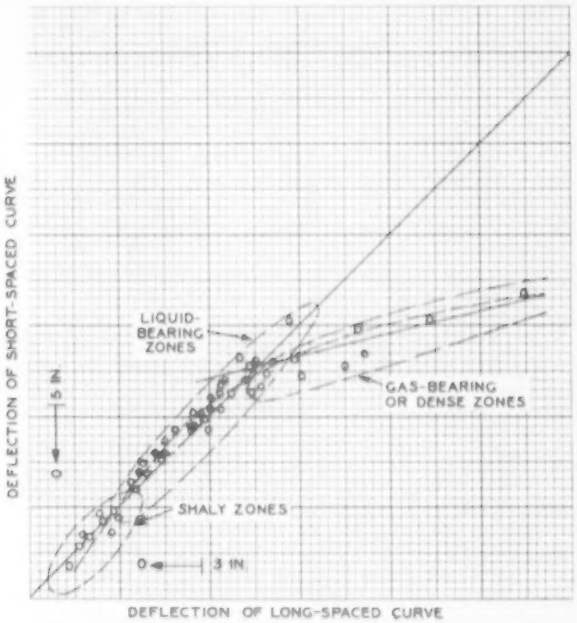
When one spacing is of the order of 9 to 10 in. greater than the other, the intensities of radiation observed at the longer spacing are many times smaller than the intensities observed at the shorter spacing. Normalization then requires that the long-spaced curve be recorded at a much greater sensitivity, in effect, amplified, in order that it will deflect the same distance as the short-spaced curve over a portion of intensity range.

Ordinarily the long-spaced curve is run at a sensitivity 6 to 10 times as great as that of the short-spaced curve, to obtain normalization. In general the operator must displace the long-spaced curve to the right to achieve the desired coincidences in shale and in the control zone. Without these alterations the "unnormalized" curves would present a quite different appearance and would be difficult to interpret.

To avoid excessive statistical errors the long-spaced curve may be run at one-third normal speed and with three times normal time constant. Normalization of the two neutron curves may be accomplished by suitable adjustment



PLOTTING DEFLECTIONS of two neutron curves helps establish a fixed relationship regardless of whether the curves are normalized. Normalized curves for shaly or liquid-bearing formations approach a straight line. Fig. 3.



INTERPRETATION established in Venezuela shows relative deflections of the two neutron curves for different types of formations. The marked deviation of the gas or dense-zone points shows as separation on the log if the curves are normalized. Fig. 4.

of the logging equipment at the time of recording the log or by pantographing and relocating the curves after they have been recorded. The latter method can minimize the time consumed on the well by eliminating trial adjustments in the field.

Curve separation . . . The amount of separation of the M-S neutron curves, in addition to their position, differentiates liquid-bearing zones from gas or dense zones in zones which record as lows on the gamma-ray curve. Large positive separations indicate gas-filled porous zones or zones lacking porosity. Small positive separations are of course somewhat less certain. Absence of separation or small negative separations indicate liquid saturation, provided the gamma-ray curve records a low intensity.

Higher gamma-ray values indicate a shaly condition. Coincidence of the two neutron curves at the extreme left, accompanied by a relatively high gamma-ray intensity, indicates shale.

These rules, which apply in the great majority of cases, are illustrated in Fig. 1. This interpretive method has been especially successful in Venezuela where porosities are found to vary over a relatively narrow range, but where the likelihood of either gas or liquid occupying the pore space is about equal. While there are numerous examples of wells in which a single neutron curve, run at a suitably long spacing, would permit substantially identical interpretation, the use of two curves, one of which responds more sensitively than the other to the gassy formations, enables greater confidence to be placed upon the conclusions derived from the radioactivity log. Thus, in these instances, the M-S log is preferred over a single neutron curve.

Logging changes . . . Other cases also exist in which the M-S log demonstrates its ability to furnish information which no single neutron curve alone can provide. An example of this is shown in Fig. 2. On this log a different relationship between the long and short-spaced neutron curves prevails above 9,600 ft. from that which exists below this depth.

This signifies that the line of demarcation between liquid-bearing and nonliquid-bearing formations has shifted. A single curve is insufficient to show that this has occurred, and a vertical line, positioned to agree with conditions in the lower zones, which would properly differentiate between liquid and absence of liquid in these zones, would give erroneous results if extended through the upper section.

The M-S log shows that the two sections are different. One way of stating this difference is to say that above 9,600 ft. the two curves of the M-S log do not appear to be normalized. That is, they no longer coincide at the same intensity values as was the case below 9,600 ft. The appearance of the two curves could be restored by readjusting the sensitivity and zero position of the long-spaced curve, so as to again obtain coincidence of the two curves at the same intensities. For this particular log it would require an increase of sensitivity and a slight shift to the right to achieve this condition; then the curves would again be normalized.

Plotting changes . . . An alternative procedure for analyzing an M-S log, which may be applied regardless of whether or not the curves are normalized, consists of plotting the deflections of one curve as ordinates while the deflections of the other are plotted as abscissas. A typical example of such a plot is shown in Fig. 3, while Fig. 5 shows the M-S log from which it was derived.

While a curved or bent line drawn through these points usually best fits the data, in many cases all of the points will lie close to a straight line.

When the scattering of the points above and below the line is no larger than the random statistical variations of the neutron curves, no particular significance can be given to their displacement. But a considerable displacement of a point or an entire group of points is significant. Analysis of this condition can yield much more information than either one of the two neutron curves alone can contribute. This condition may show the boundary between the liquid-bearing and gas-bearing or dense zones, depending upon

FIELD LOG shows how separation of curves occurs for gas zones. Note that the curves are normalized in the control zone. Fig. 5.

where the points deviate from the line. Other applications may be found when the reasons underlying this phenomenon are more fully understood.

Causes of change . . . A change in the relationship between the two neutron curves can be expected wherever bore-hole conditions change significantly, such as in passing from open hole into casing, or from a section of one diameter to another. Similarly, a change of this type can be expected at the fluid level in the bore hole. It might also be expected for different gas-bearing formations which have different depths of invasion of the bore-hole fluid filtrate. Curves for very thin zones sometimes depart from the predominant relationship for a well; this is generally believed to represent the inability of one of the two curves (ordinarily the long-spaced curve) to respond fully within the thin bed.

Inspecting curves . . . Observing a significant deviation from the predominant relationship is aided by plotting the deflections of the neutron curves, but the deviation can be observed directly by close inspection of the two neutron curves of the M-S log. First, the predominant relationship is noted by observing that the separation between the two curves is a somewhat regular function of the reecorded intensity. In general the amount of positive separation (long-spaced curve to right of short-spaced curve) tends to increase rapidly as the intensity (of either curve) increases above a certain value. Below this value the two curves ordinarily show no separation or small negative separations.

Having ascertained this, one can search for zones which fail to conform to this pattern. These are the zones which will fail to plot on or near the line representing the predominant relationship, as in Fig. 3.

On this type of plot a positive separation between the neutron curves causes the points to fall below a straight line of 45° slope and a negative separation places the points above it. Usually the predominant relationship is represented by a bent or curved line. Deviation from this relationship causes the points to be displaced markedly from the line. A number of such points may define a second line.

Explaining deviation . . . The broadest meaning of such points, provided their displacement is significantly greater than that attributable to statistical fluctuations, is that the zones which they represent fail to conform to the particular interpretive procedure which is valid for the other zones. For example, suppose a deflection of the short-spaced curve greater than say 2.5 in., is frequently (on this particular log) accompanied by a positive separation of 1 in. This is accepted as characteristic of gas-filled porosity throughout the well. A deflection of 2 in. for the short-spaced curve is normally accompanied by no separation between the curves, and is accepted as being representative of liquid-filled porosity. Then a zone which caused a 2.5-in. deflection of the short-spaced curve with zero or negative separation or a zone which produced a 2-in. deflection of the short-spaced curve with a 1-in. positive separation, would fail to conform.

Such zones would certainly be misinterpreted if only one of the two neutron curves were available, since there would be no way to distinguish these zones from the others. Individual isolated zones which fail to conform to a predominant relationship existing throughout the remainder of the well are still difficult to interpret, though it is often valuable to know merely that their interpretation should not be carried out on the same basis as the majority of the formations.

However, when an entire section of a well fails to conform with another section it is a relatively simple matter to alter the interpretive procedure appropriately. Finding a new set of intensity values or deflections which apply to the second section of the well is ordinarily no more difficult than the task of establishing the values used in interpretation of the first section. The important contribution of the M-S log to this situation is the fact that its analysis shows that the first set of values should not be applied, without alteration, to the second section of the well.

Field Successes

In Venezuela, where porosities vary only slightly, but fluid content varies between liquid and gas, M-S logs show a particularly sharp bend in the relationship between the short and long-spaced curves. It is likely that this sharpness is emphasized by making the lesser of the two spacings especially short. Considerable success has accompanied an interpretive procedure which depends, in part, upon the sharpness of this bend.

Interpretation . . . The appearance of a carefully normalized M-S log of this type is characterized by a predominant lack of separation for all intensity values (deflections) up to a certain amount, then above this the sudden appearance of positive separations between the two curves. An intensity equal to or just slightly above this value is successfully interpreted as the dividing line between liquid and gas-filled porosity. Further, any positive separations occurring below this intensity are also interpreted as nonliquid-bearing zones. The absence of separation or a negative separation occurring above this intensity is interpreted as liquid bearing, though of

less porosity than the other liquid-bearing zones.

This procedure is especially helpful in confining perforation intervals to oil-producing zones, thus avoiding costly perforating and squeeze cementing of unwanted gas-producing zones. However, in the converse situation, where gas production is desired and liquid is to be avoided, an identical interpretive procedure is somewhat less successful. This is because dense limestone and other tight formations, as well as gas-bearing zones, tend to produce large deflections and large positive separations between the M-S curves.

Exceptions . . . Cases in which gas-bearing zones may fail to show a positive separation are: (1) When liquid and gas are simultaneously present, (2) when the density of the compressed gas within the reservoir is so great that its hydrogen concentration is nearly equal to that of the liquids, (3) when the porous material has been invaded by well fluid to a depth comparable with the depth of penetration of the neutron curve. In these cases the zone will record with little or no positive separation, as though it contained liquid rather than gas. Tests of such a zone may yield a commercial amount of gas without appreciable quantities of liquid. Where such zones are present they may detract from the success of either gas finding or gas avoiding.

Using graph . . . Fig. 4 illustrates the above interpretive procedure applied to the points which were plotted in Fig. 3. Points which fall on or near the line in the lower left portion of the graph are interpreted as shales, confirmation of this being obtained from the gamma-ray curve. Points which fall on or near the middle section of the line or along an upward extension of this section of the line are interpreted as liquid-bearing zones (provided the gamma-ray curve indicates these zones are free of shale), while points which fall on or near the bent portion of the line are interpreted as gas-bearing or dense zones. Possible gas-bearing zones are indicated in the overlap area between the two latter groups of points.

Future Work

Up to the present time the number of M-S logs run in other areas has been insufficient to establish universal rules for their interpretation or to clearly indicate in all cases their superiority over a single neutron curve made with an appropriate spacing. In certain areas no significant departures from a fixed relationship between the two curves have yet been observed. The maximum benefit which M-S logging can provide has thus not yet been attained in these areas.

Under these circumstances one neutron curve may supply all the required data, but the two curves of the M-S log supply additional confirmation which is especially desirable in any doubtful zones. Further, the appearance of a carefully normalized M-S log simplifies the comparison of one zone with another.

Where significant departures from a fixed relationship exist, the M-S log is providing more information than can be fully utilized at the present time. The causes for such departures are not yet fully understood, though it is already clear that variations in bore-hole conditions and depth of invasion cannot account for all of them. Further understanding of this phenomenon is being pursued actively in the expectation that it will uncover valuable information which has heretofore been unobtainable by means of neutron logging.

Theoretical reasons . . . On a theoretical basis one might expect to find a predominant, but not necessarily unique, relationship between the intensities observed at two different distances from a neutron source. A number of investigators have found the intensities of both gamma radiation and slow neutrons (either or both of which are detected in one or another of the commercial logging systems) to diminish exponentially as the distance between the source and the detector is lengthened. The results obtained with various actual and simulated rock formations exhibit different slopes but always appear to agree with an exponential law.

Depends on formation . . . It can be shown, on the basis of a few simplifying approximations, all of which appear to be valid, that the slope of such an exponential curve, in the region beyond a relatively close distance from the source, is determined principally by the penetrating ability of the most penetrating form of radiation involved in the process.

For neutron logging it seems clear that in any earth material the most penetrating radiation is the fast neutrons emitted by the source. The slow neutrons are certainly less penetrating than the fast neutrons in any ordinary substance. The gamma rays produced by the neutrons are also plausibly less penetrating than the fast neutrons under any ordinary subsurface condition.

Hence, the slope of the exponential curves can be expected to be dependent on the ability of the fast neutrons to penetrate the particular material. Accordingly, several particular sets of circumstances could then cause a fixed relationship to prevail between the intensities observed at one spacing and those observed at another.

Constant conversion . . . One such circumstance would result if the exponential curves, of whatever slope, all met at a single point, say in the vicinity of the location of the source. Under this circumstance the relationship between all the intensities observed at one particular spacing and the corresponding intensities observed at a greater spacing would be found to be a power law.

Let us ask how such a situation might occur. It should occur if all of the emitted radiation is somewhere transformed or converted into the form of radiation to which the detector responds, or alternatively, if some constant fraction of the emitted radiation is so converted. That a substantially constant fraction of all the emitted fast neutrons should be slowed down and thus become slow neutrons is not at all surprising since, for fast neutrons, collisions which cause the neutrons to lose part of their energy are much more likely to occur than is total absorption.

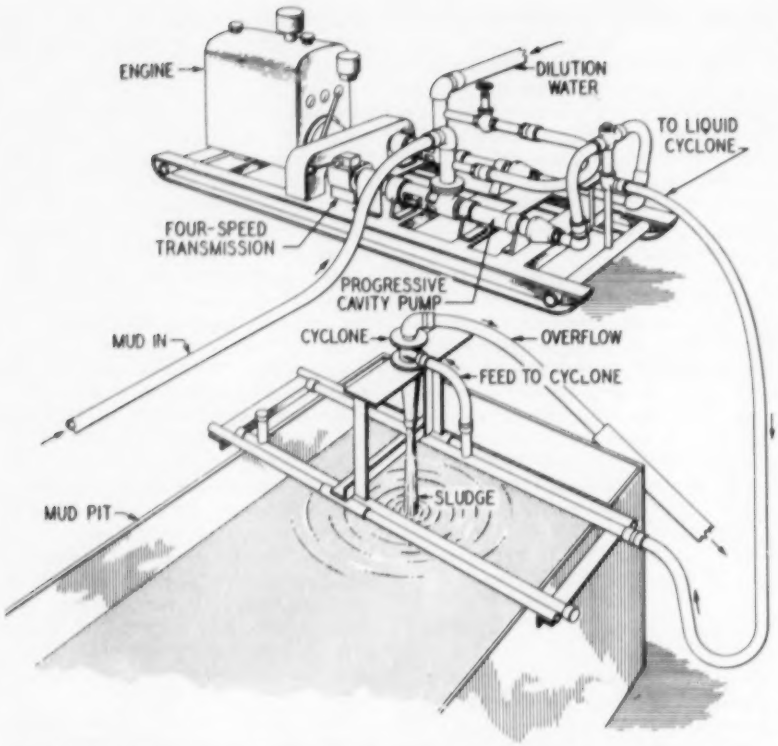
Thus, if only a very small fraction of the fast neutron flux is lost by absorption, the fraction which becomes slowed down must be substantially constant, as it is very nearly unity. It is perhaps more surprising to consider that a constant fraction of the neutrons should always be converted into gamma radiation. But even this is not implausible in consideration of the very great similarity between well logs obtained with a detector which responds solely to neutrons (N-N logs) and a detector which responds to gamma radiation (N-gamma logs).

Possibly the gamma radiation observed with the latter detector is chiefly produced by neutrons which are absorbed in the immediate vicinity of the detector, and are not therefore appreciably influenced by the formation characteristics.

Neutron penetration . . . Regardless of these conjectures, there is at least one other circumstance which would result in a fixed relationship between the intensities observed at one spacing and those observed at another. The circumstance would require that the fraction of the emitted radiation which is converted into radiation to which the detector is responsive bear some definite relationship to the ability of the fast neutrons to penetrate the material.

Acknowledgment

Appreciation is expressed to the management of Well Surveys, Inc., Tulsa, and Petro-Tech Service Co., Caracas, for permission to publish this article.



CYCLONE SEPARATION UNIT used by Phillips consists of 3-in. cyclone fed by two pumps. Powering the pumps is a 15-hp. engine. Both weighted and unweighted muds are treated. Fig. 1.

DRILLING . . . *METHODS*

Liquid Cyclone Cuts Cost Of Treating Drilling Fluids

by W. E. Bergman, C. J. Engle, S. J. Marwil, and E. W. Porter

PIT jetting for removal of sand and other drilled solids which accumulate in drilling mud leads to high mud costs. Use of a 3-in.-diameter liquid cyclone on the mud stream can almost completely overcome this problem.

With unweighted muds, the sand and other drilled solids may be concentrated to a high-density sludge which is discarded. The saving in water dilution, compared with pit jetting, commonly amounts to 80 to 90 per cent. Effectiveness is dependent upon the particle size of the drilled solids.

With weighted muds, the barite may be recovered while the colloidal clays are discarded. The barite saved compared with pit jetting is dependent on many factors but will usually fall in the range of 60 to 90 per cent.

Authors are with Phillips Petroleum Co., Bartlesville, Okla.

Need is present . . . Inefficient methods for treating and handling drilling fluids are tolerated despite their high cost. During typical drilling operations much valuable mud is discarded by jetting, and the entire mud system is frequently abandoned when the well is completed.

Centrifuges and cyclones have been considered spasmodically for a number of years to decrease this loss of valuable drilling fluid.[3 4 5 9 12 13 14] Their function is to remove sand or drilled solids and to recover barite. This is accomplished on unweighted muds by concentration of the coarser solids so that there is a decrease in the need for water dilution. The concentrated solids are rejected to the reserve pit.

The high-density barite in weighted muds is concentrated in the sludge and returned to the system while the colloidal clays along with some water-soluble chemicals are discarded. Until recently, operational and mechanical difficulties with the centrifuge have discouraged full acceptance; but during the past 3 years, successful applications have been achieved.[2 8 10]

The liquid cyclones previously described for treatment of muds had a diameter of several feet. For the conditions of use, only coarse sand could be removed from the mud. This severely restricted their application. Wuth and O'Shields[15] recently described the application of 6-in.-diameter cyclones for desanding. During the past few years laboratory and field tests by Phillips Petroleum Co. have been in progress with 3-in.-diameter cyclones. The exploratory work[1] indicated that efficient removal of sand and drilled solids as well as recovery of barite might be accomplished.

This article describes pertinent fac-

The authors say . . .

Results of field tests with a 3-in.-diameter liquid cyclone justify optimism for widespread application. A single cyclone operated for the removal of drilled solids may readily concentrate as much as 50 tons of solids a day from Gulf Coast muds. Where necessary, cyclones may be operated in parallel to obtain a higher capacity.

With weighted muds, a substantial reduction may be made in the barite required to maintain the density of the mud.

Indirect advantages from cyclone operation include improvement in control of the mud, decreased pump and bit wear, and increased penetration rate. Some maintenance problems due to wear on parts of the unit (the cyclone and pumps) have been encountered but are not considered critical.

tors regarding the design and operation of equipment assembled for field tests (Fig. 1) and presents typical results of field tests.

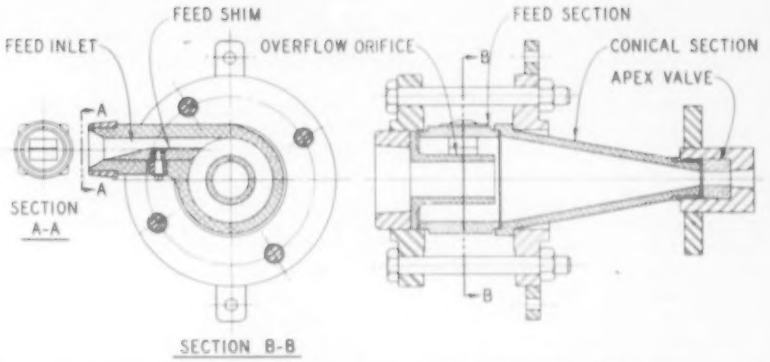
Cyclone Operation

In principle the liquid cyclone is a simple device. As shown in Fig. 2 the cyclone contains no moving parts. Most cyclones are described simply in terms of the diameter of the cylindrical feed section and the cone angle which is commonly 5° to 25°. The tests described here were with a 3-in.-diameter cyclone having a 20° cone.

Other dimensions which may critically affect cyclone operation include the size of the feed, overflow, and underflow orifices. For fixed dimensions the feed rate becomes a function of the pressure drop across the cyclone, and this determines the centrifugal force which is developed. A knowledge of the effect of the various factors permits use of a given cyclone over a wide range of conditions.[6,7,11] This versatility is desirable when considering the different problems encountered with drilling fluids.

TABLE 1
Removal of Drilled Solids From Unweighted Gulf Coast Muds Using the 3-In.-Diameter Cyclone

Test No.—	1	2	3	4	5
Orifice area, sq. in.:					
Feed	0.3	1.0	0.2	0.2	0.3
Overflow	0.2	0.5	0.2	0.4	0.4
Underflow	0.2	0.2	0.1	0.2	0.2
Pressure, psi.	60	155	180	180	115
Flow rates, g.p.m.:					
Mud	34	61	36	50	52
Overflow	31	58	34	44	48
Sludge	2.8	2.3	1.8	6.1	4.1
Density, lb. per gal.:					
Mud	9.9	9.75	9.7	10.0	9.9
Overflow	9.3	9.3	9.4	9.4	9.4
Sludge	14.0	15.55	16.25	15.3	15.8
Solids, per cent by wt.:					
Mud	25.8	23.7	23.0	28.7	26.5
Overflow	16.8	16.8	18.4	18.4	19.9
Sludge	66.0	75.7	79.0	74.0	76.8
Solids removed in sludge:					
Lb./lb. in feed	0.37	0.23	0.28	0.48	0.36
Tons per day	18	20	16	50	36
Dilution savings, per cent	82	90	92	86	89



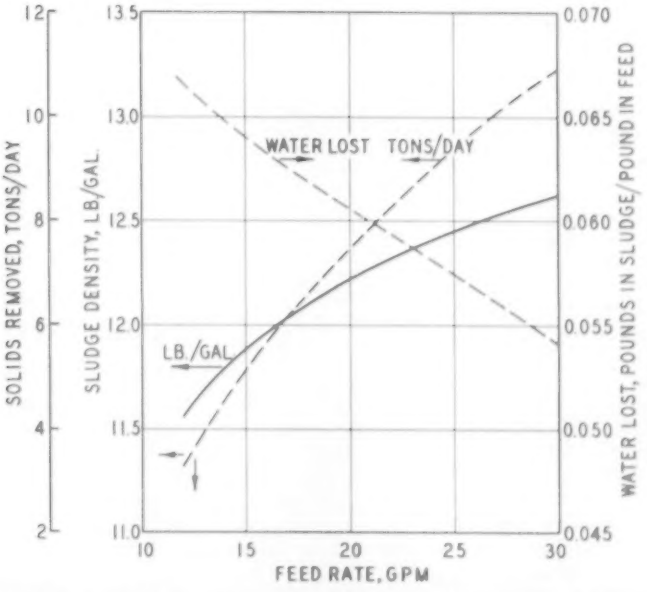
TEST CYCLONE has adjustable feed, overflow, and underflow openings. There are no moving parts and centrifugal force developed is determined by pressure drop. Fig. 2.

Unweighted muds . . . The effect of increase in feed rate (resulting in increase in pressure drop across the cyclone) upon the operating characteristics is shown in Fig. 3. For this test a 9.6-lb. per gal. slurry was prepared with kaolin, 99.5 per cent of which passed through 325 mesh. The weight-average particle size was about 5μ.

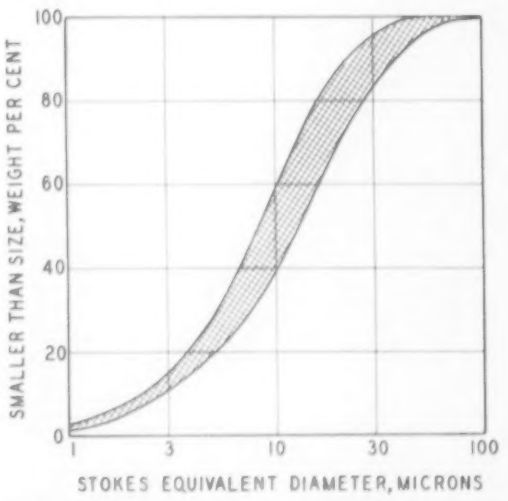
Increase in feed rate increases the sludge density, the tons of solids removed per day, and the water savings. Water savings are based on a comparison of water lost with pit jetting to remove drilled solids. To compute the water savings the difference in the weight ratio of water to clay in the mud and in the sludge is divided by the weight ratio in the mud.

Weighted muds . . . Similar tests with weighted muds established that an increase in pressure will increase recovery of barite. Recovery will also be improved by an increase in the ratio of the diameter of the underflow orifice to the overflow orifice.

The magnitude of barite concentration



INCREASING FEED RATE increases solids removed and decreases the water lost by processing unweighted muds. However, pressure drop also increases. Fig. 3.



PARTICLE-SIZE range of barite is sufficiently broad that complete separation of barite and clay particles is not possible. Fig. 4.

in the sludge solids is dependent on the ratio of clay to water in the mud (hence, extent of dilution of the mud prior to separation of barite) and the density or water content of the sludge containing the recovered barite.

A particle-size analysis of typical samples of barite are summarized in Fig. 4. Other solid components which may exist in a weighted mud cover this same size range. Despite differences in density, complete separation of the barite and clays is not possible by any single-stage centrifugal process. In addition, factors which tend to increase the recovery of barite increase corecovery of the drilled solids. As a result, optimum operating conditions cannot be readily predicted.

In order to express the effectiveness of the cyclone for recovery of barite, a per cent savings in barite may be computed from the difference in the weight ratios of barite to clay in the feed and overflow divided by the weight ratio of the barite to clay in the feed. This is a measure of the difference between the amount of barite required when conventional pit jetting is used and when proper application of the cyclone is made.

Field Equipment

Equipment assembled for field tests of the liquid cyclone is shown in Fig. 1. A multicylinder engine which has a continuous-duty rating of about 15 hp. at 1,100 r.p.m. is used to drive two pumps. Each pump is rated at approximately 5 g.p.m. per 100 r.p.m.

Both pumps are used for mud when processing unweighted muds. When processing weighted muds, one pump is used for water. While not shown on Fig. 1, a water meter with a bypass can be inserted in series with the water pump. The speed of the mud pump can be adjusted by means of the four-speed transmission which has gear ratios of 1 to 1, 2 to 1, 3 to 1, and 4 to 1. With this arrangement and a constant dilution rate, the density of any weighted mud encountered in the field can be reduced to the desired range of 10 to 11 lb. per gal. before being fed to the cyclone.

Dual use . . . The cyclone is mounted on an adjustable bracket. When sand and drilled solids are to be discarded, the cyclone may be conveniently mounted over the side of the mud tank or over the reserve pit while the overflow (recovered mud in this case) is returned to the system.

For barite recovery, the cyclone is mounted over the mud pit. The high-density sludge containing the recovered barite is discharged directly into the mud system while the overflow is discarded to the reserve pit. In some cases the overflow mud might be of sufficient value to save for use as an unweighted mud on other wells.

Adjustable . . . The test cyclone, shown in cross-section in Fig. 2, has shims to adjust the size of the rectangular feed orifice. Overflow orifices (vortex finders) having internal diameters from 0.25 to 1.5 in. may be inserted as desired. The diameter of the underflow or apex opening may be varied by use of an adjustable rubber valve or by inserting a metal orifice of the desired diameter, generally 0.2 to 0.5 in.

Field Tests

The test cyclone has been run on several Gulf Coast locations. Typical results on unweighted muds are given in Table 1. These results show that 20 to 50 per cent of the solids in the mud may be rejected as a sludge having a density in the range of 14 to 16 lb. per gal. The result is manifest by a decrease in the density of the overflow and a reduction in the per cent solids in the muds. The mud returned to the system is essentially free of sand.

With these muds satisfactory operation may be achieved over a moderate range of pressure (60 to 220 psi.) and other operating conditions. Hence the operation is not critical. This is attributed partly to the fact that the solids encountered in these unweighted Gulf Coast muds are relatively coarse. In other areas where the drilled solids are predominately smaller than 325 mesh (44μ), effective removal of the drilled solids requires operation at pressures as high as 150-220 psi. while using a large ratio for the overflow to underflow orifice size.

It should be noted that the results shown in Table 1 indicate a marked decrease in need for water dilution and a consequent savings in chemicals.

TABLE 2
Recovery of Barite From Gulf Coast Muds With the 3-In.-Diameter Cyclone

Test No.—	1	2	3	4	5
Orifice area, sq. in.:					
Feed	0.2	0.5	0.5	0.5	0.2
Overflow	0.2	0.8	0.4	0.4	0.4
Underflow	0.1	0.2	0.2	0.2	0.2
Pressure, psi.	190	97	155	155	170
Flow rates, g.p.m.:					
Mud	17.7	14.9	14.3	18.6	17.7
Water	18.5	55.0	55.0	56.8	34.5
Overflow	33.5	66.0	64.1	68.6	47.9
Underflow	2.7	3.9	5.2	6.8	4.3
Density, lb. per gal.:					
Mud	11.1	14.0	14.0	14.9	15.6
Overflow	8.8	8.8	8.5	8.7	8.5
Underflow	18.5	21.4	20.2	20.7	20.6
Solids, per cent by wt.:					
Mud	38.5	56.3	56.3	58.6	65.2
Overflow	10.5	8.9	4.5	5.8	4.4
Underflow	79.4	81.8	79.5	79.8	79.2
Density of solids, g./cc.:					
Mud	3.41	3.94	4.00	3.95	3.82
Overflow	3.15	3.59	3.12	3.31	3.30
Underflow	3.53	4.05	4.11	4.18	4.08
Barite in solids, per cent by weight:					
Mud	59.8	86.0	88.5	88.4	80.0
Overflow	43.8	69.0	41.6	54.5	53.5
Underflow	66.5	90.7	93.2	96.0	91.0
Barite savings:					
Per cent*	46	64	91	84	71
Tons per day	19	45	56	78	46

*The per cent saved is the value computed from the ratios of barite to clay in the mud and overflow, and hence is the savings over pit jetting. The value for tons per day is the amount returned by the sludge.

Barite recovery . . . Table 2 illustrates the results for the recovery of barite from muds having a density of 11 to 15.6 lb. per gal. In all cases, the barite in the mud can be concentrated to a high-density sludge. The results reported for the per cent barite in the solid phase were estimated from the density of the solids assuming a density of 4.3 g. per cc. for the barite and a density of 2.6 for other solids.

These results, as well as those for unreported tests, show that the barite can be recovered in tonnage quantities per day. This emphasizes the high capacity of the cyclone. The potential savings in barite required to maintain the mud will commonly fall in the range of 60 to 90 per cent. This savings is based on a comparison with pit jetting. However, it cannot be claimed that jetting can be entirely eliminated; hence the actual savings in barite will be less than calculated.

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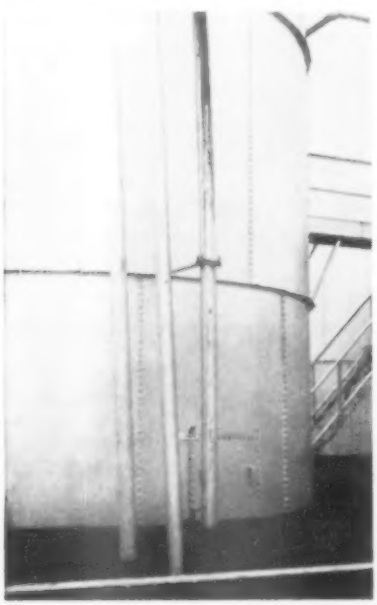
Plastic Pipe . . . Has Oil-Field Use

PLASTIC pipe is now well established in oil-field use. It is used primarily to handle sour crude oil and salt water. Here its initial cost, which may be slightly higher than that of steel pipe, is more than compensated for by the longer life of the plastic pipe. Plastic pipe is easily handled and rapidly laid. Lengths are easily joined. Paraffin or scale buildup is minimized. Friction losses are lower.

Plastic pipe is by no means replacing steel pipe in all uses. But it is increasingly used to advantage for oil, water, or gas lines where fluids being handled, or the soil, are corrosive or where there is possibility of solids buildup. Companies surveyed recently indicate that they contemplate installation of additional plastic lines in new installations or in replacement of steel lines where there is a critical corrosion problem. Many multimile lines have been laid of cellulose acetate butyrate, acrylonitrile-styrene copolymer, and rigid polyvinyl chloride. Other types—epoxies, fluorocarbon plastics, and reinforced polyesters are also being tested for transportation of sour crudes and salt-water disposal.

OFFSHORE these plastic flow lines run to production tanks of Shell Oil Co. at Dixon Bay, Plaquemines Parish, Louisiana.



Various oil-field areas—Gulf Coast, Rocky Mountain, and Kansas — now employ plastic pipe. Experiences of two companies — a construction company and an operating oil company—in Kansas are noted here.

Field Experience

Hess & Bruce Construction Co. has used butyrate-type and polyvinyl chloride plastic pipe in the Canton-Ritz oil field in Kansas. This company installed a major portion of the salt-water-disposal systems in Canton-Ritz oil field with plastic pipe and also installed many lead lines of plastic. Table 1 summarizes this experience.

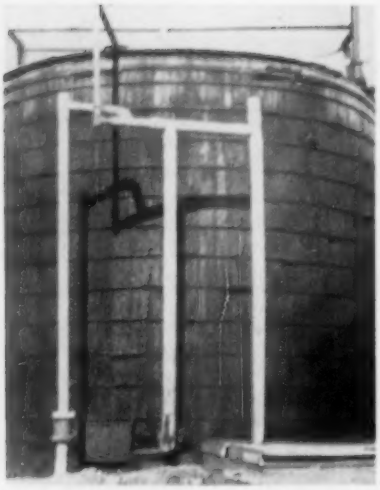
Field conditions . . . Plastic lines are being used at temperatures running from 50° to 100° F. Pressures range from atmospheric to 35 psi. Crude oil is sweet in Canton-Ritz field. Line sizes installed range from 1¼ to 6-in., the most common being 2-in. for lead lines or salt-water lines.

All lines installed by Hess & Bruce have been of the solvent-applied sleeve type. Results have been good with these sleeves. Out of hundreds of thousands

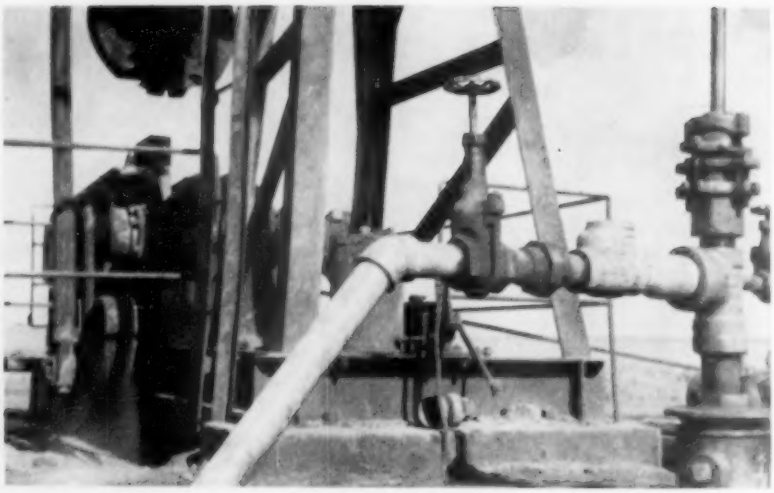
Table 1—Experience Summary—Use of Plastic Pipe in Canton-Ritz Field, Kansas

(Salt-water-disposal lines and lead lines)

1. **Conditions under which plastic pipe is used.**
   - A. Temperature of fluid in pipe—50° to 100° F.
   - B. Pressure of fluid in pipe—0 to 35 psig.
   - C. Fluid handled—crude oil and salt water.
   - D. Sweet or sour crude?—Sweet.
2. **Piping system.**
   - A. Size—1¼ to 6-in.
   - B. Screwed joints or solvent-applied sleeves?—Sleeves, except for threaded adapters.
   - C. How and where connected to metal pipe?—With threaded adapters at wellhead and wash tanks.
3. **Field experience**
   - A. Advantages
     1. How has the installation helped solve an operating problem?—No corrosion; no paraffin.
     2. How do the economics of the plastic-pipe system compare with a steel-pipe system?—Slightly higher cost but cheaper in the long run due to long life of plastic system.
   - B. Disadvantages
     1. Any leakage?—Three or four leaks out of hundreds of thousands of feet.
     2. Are plastic-to-plastic joint seals satisfactory?—Yes.
     3. Are plastic-to-steel connections satisfactory?—Yes.
     4. Have you had any paraffin deposition problems?—No.
   - C. Based on your operating experience, for what applications do you recommend plastic pipe?—All lead lines and salt-water lines where pressure and heat will allow.
   - D. Are you planning more plastic-pipe installations?—Yes.



GUN BARREL uses this plastic pipe as salt-water siphon at Stoltenberg pool, Ellsworth County, Kansas.



FLOW LINE is plastic pipe on this Cities Service pumping well in Stoltenberg pool. This is polyvinyl chloride pipe used to combat corrosion and paraffin deposition.

of feet laid, there have been only three or four collar leaks and a couple of threaded adapter leaks. Repairs are easily made with electrician's plastic tape.

Advantages . . . The two greatest advantages of plastic pipe appear to be: (1) long life for salt-water lines due to noncorrosiveness, and (2) all butyrate lead lines installed have been paraffin-free to date. The only difficulty experienced was with a 3-in. lead line on a well near Florence, Kans. This well pumps a lot of water and although the pressure surge is only 35 psi., this line

TABLE 2—PLASTIC PIPE INSTALLATIONS—WEST KANSAS DIVISION

Salt Water Lines

Lease, well, location, and county—	Inst. date	Normal est. oper. press.	Manufacturer's designation	Type of plastic	Length (ft.)	Size (in.)	Wall thickness (in.)	Leakage	Reason for installing
Schlessiger S.W.D. Sys.:									
13-20s-12w, Barton	10-55	10	Kraloy D-M	PVC	2,216	2	0.100	No	Corrosive water
Sellens S.W.D. Sys.:									
30-15s-13w, Russell	5-52	50	Western Plastics	Tenite II	1,525	4	0.150	No	Corrosive water, and corrosive soil
			Western Plastics	Tenite II	100	3	0.125	No	
Vacek S.W.D. Sys.:									
32-15s-10w, Ellsworth	6-52	0	Johnsonite	Tenite II	3,562	3	0.125	No	Corrosive water
Lead Lines Carrying Oil and Water									
Bender A, 7:									
25-15s-14w, Russell	5-52	25	Western Plastics	Tenite	1,897	2	0.125	No	External and internal corrosion
DeWitt, 4:*									
33-19s-9w, Rice	2-54	25	Green 100	Tenite II	1,153	2	0.125	No	External corrosion and paraffin
Ehrlich A, 6 and 9:									
28-13s-14w, Russell	5-56	25	Jordan RV-25	PVC	1,264	2	0.100	No	External and internal corrosion
Eichman A, 7 and 11:									
12-15s-14w, Russell	1-55	25	Western Plastics	Tenite II	2,480	2	0.125	No	External and internal corrosion
Essmiller A, 3:†									
29-21s-13w, Stafford	10-53	25	Kraloy D-150	PVC	775	2	0.100	Yes	Internal corrosion
Krug B, 1:									
13-15s-14w, Russell	5-55	25	Western Plastics	Tenite II	781	2	0.125	No	External and internal corrosion
Krug F, 2 and 4:									
13-15s-14w, Russell	11-53	25	Kraloy D-150	PVC	1,100	2	0.100	No	External and internal corrosion
Schartz B, 2:‡									
20-21s-13w, Stafford	10-52	25	Carlon B	Tenite II	1,000	2	0.125	Yes	Internal corrosion
Schroeder A, 4, 6 and 12:§									
29-17s-9w, Ellsworth	10-55	25	Kraloy D-M	PVC	1,414	2½	0.115	No	External corrosion and paraffin
				PVC	1,868	2	0.100		
Smith B, 2:¶									
16-21s-11w, Stafford	5-52	25	Carlon B	Tenite II	2,203	2	0.125	No	External corrosion and paraffin
Stoltenberg A, 3:‖									
33-16s-10w, Ellsworth	11-55	25	Kraloy D-M	PVC	1,067	1½	0.080	No	External corrosion
Stoskopf, 3:									
17-16s-13w, Barton	5-52	25	Western Plastics	Tenite II	950	2	0.125	No	External and internal corrosion
Taylor B, 3 and 4:									
34-20s-14w, Barton	8-52	25	Johnsonite 4	Tenite II	1,921	2	0.125	No	Internal corrosion and paraffin
Tittel A:									
12-15s-14w, Russell	1-50	25	Carlon B	Tenite II	3,150	3	0.125	Very little	External and internal corrosion

*DeWitt 4—Replaced 2½-in. steel line pipe with 2-in. plastic. †Essmiller A, 3—This line was replaced with steel after failure due to high well pressures. ‡Schartz B, 2—This line was replaced with steel after splitting when a pig was pumped through it. §Schroeder A, 4, 6 and 12—When this line was tested, two pin holes in the body of the pipe and two faulty factory collars were found; no trouble after initial repairs. ¶Smith B, 2—This line replaced 3-in. steel line pipe in a salt marsh. ‖Stoltenberg A, 3—Replaced 2-in. steel line pipe with 1½-in. plastic.

THREADED PIPE BENDS and threaded adapter nipples being applied here in South Oilton pool, Payne County, Oklahoma, are schedule 80 polyvinyl chloride.

FLANGED CONNECTION of plastic pipe to gun barrel is rigid polyvinyl chloride. This is salt-water-disposal line in South Oilton pool.

has split several times right close to the well. It is believed that this failure has been due to the constant expansion and contraction with variation from 0 to 35 psig. with each stroke of the pump.

Cities Service Oil Co. uses plastic pipe extensively in its West Kansas division. This experience is summarized in Table 2.

Cities Service has installed 30,426 ft. of plastic pipe for water and oil lines on 17 leases in the West Kansas division since January 1950. Two of these lines have been replaced, leaving a total of 28,651 ft. of plastic lines on 15 leases that is now in use.

In addition to use in buried lines, a number of gun-barrel siphons have been made from plastic pipe.

Good service . . . With the exception of two cases, the plastic pipe has given excellent service and materially reduced maintenance costs by eliminating leaks from corroded steel pipe. No installations have been made just to solve the paraffin problem, but this has been an added benefit. In several cases it has been possible to replace steel lines with plastic lines of a smaller size.

Use of plastic pipe has been limited to rather low pressures and wellhead temperatures. No difficulties have been encountered in handling the sour oils or corrosive waters of West Kansas. All the pipe in service has employed solvent-applied sleeve couplings for joining plastic to plastic and threaded plastic adapter nipples for joining plastic to steel. These methods of joining pipe have proved satisfactory.

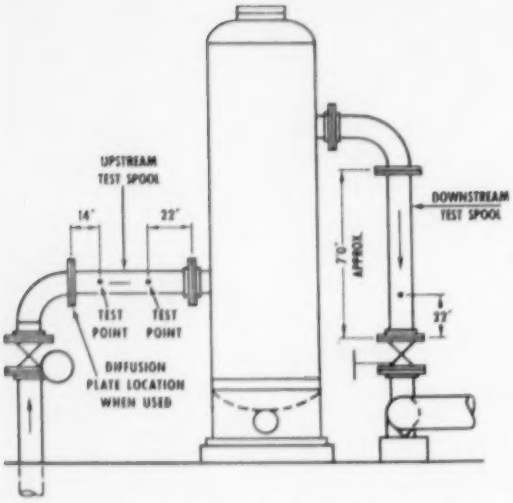
Watch pressure surges . . . Of the two failures experienced, one was a result of pumping a pig through the line when a very heavy emulsion had developed. The other failure resulted from sudden pressure surges from the well. Care should be taken in choosing the applications for plastic pipe to eliminate any wells where pressure surges will be encountered. Paraffin buildup in steel pipe and fittings in the system can also result in failures unless plastic-lined steel is used or a pig is run frequently.

Plastic pipe can be used to an advantage for oil, water, or gas lines in areas where the fluid is corrosive or deposits scale or paraffin or where the soil is corrosive. It is easily handled and can be laid rapidly with a small number of men. Its smooth surface resists paraffin or scale buildup and eliminates the need for oversizing lines to have adequate future capacity.

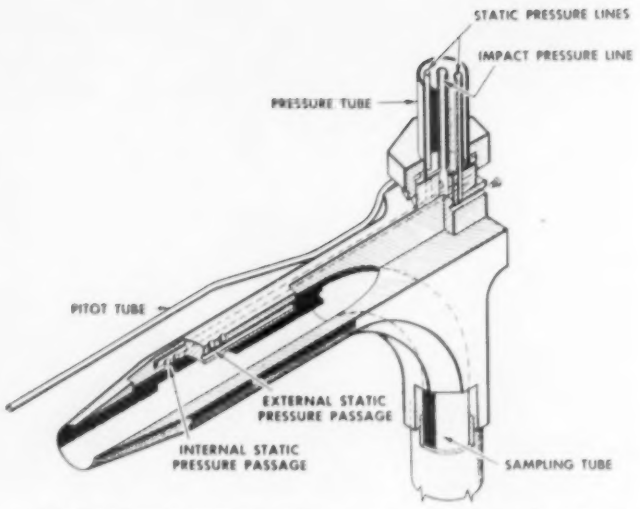
Plastic pipe has the disadvantage of being applicable only at low pressures and moderate temperatures. It is quite often brittle and must be treated carefully while backfilling. There is evidence that some plastics are susceptible to creep and aging effects.

It is expected that a number of plastic lines will be installed in the future, both on original installations and in replacements of steel lines having a large number of corrosion leaks.

WATER-DISPOSAL line at South Oilton pool is 4½-in. schedule 40 rigid polyvinyl chloride with a working pressure of 130 psi. at 75° F. Line is being laid with slip type of couplings cemented with solvent.



TEST INSTALLATION provides a sampling device upstream and downstream from a gas cleaner. Fig. 1. Sampling is by a . . .



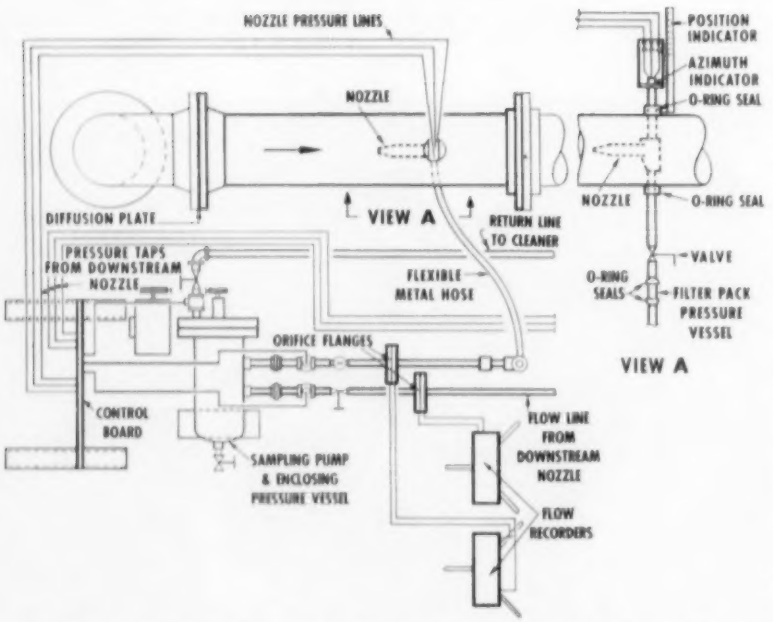
. . . **SHARP-EDGED NOZZLE** with pressure taps to allow outside and inside gas velocities to be made equal. Fig. 2.

Here's an accurate and useful tool for

Sampling Particulate Matter

. . . *in high-pressure gas streams*

by R. L. Solnick



TESTING SYSTEM leads high-pressure gas from each nozzle through a filter pack, an orifice meter, and then into a pressure vessel. Within the pressure vessel a low-pressure pump boosts the gas back to the pipeline. Fig. 3.

THE determination of particulate matter concentration and size distribution in high-pressure gas pipe lines may be accomplished with equipment designed on well-established principles but modified to accommodate high pressures.

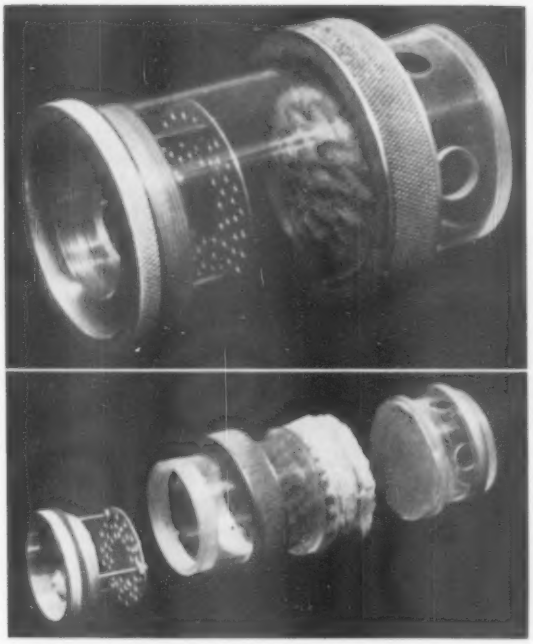
One such device has been built and tested. The results indicate that an accurate and very useful tool has been developed.

Plan of attack . . . The general plan of attack was to base the design of the sampling apparatus on experimental work performed by previous investigators and on newly developed techniques when necessary.

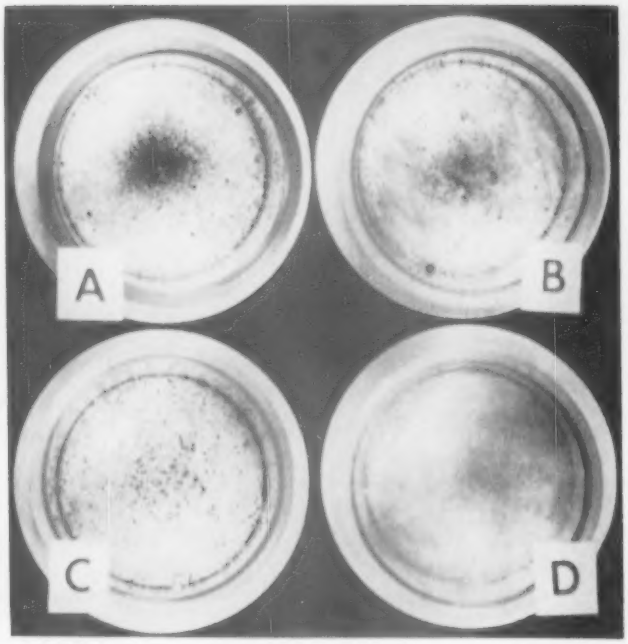
After completion of the design and performance of a minimum amount of work on the individual component parts in the laboratory, the plan called for installation of the entire assembly in

Author is principal research engineer, Fluor Corp., Ltd., Whittier, Calif. Paper presented at A.S.M.E. petroleum-mechanical conference, Dallas, 1956.

PIPELINING



FILTER PACK of plastic contains a glass-fiber pad which removes all particles 0.3μ and larger. Flanges pressing on the pad prevents gas bypassing at the wall. Fig. 4.



USED FILTER PADS, A, B, and C, show matter removed in upstream pack. Pad D is from downstream pack. An analytical balance determines the matter removed on a test run. Fig. 5.

a field location that could be used for development and test purposes.

Arrangements were made to install a sampling device directly upstream and downstream of a gas cleaner operated by a local natural-gas pipeline company (Fig. 1). This cleaner had a capacity of 40 M.M.s.c.f.d. at a pressure of 250 psi. and used oil as a scrubbing medium in the conventional manner; i.e., fine oil droplets entrained in the gaseous stream first "washed" the gas and then were removed in an eliminator section.

The gas being handled by the cleaner was known to contain reasonably large quantities of both solid and liquid particulate matter, which was desirable from a test standpoint.

Design Considerations

Some consideration was given the possibility of developing a device which would be capable of indicating particulate size and concentration without removing any gas from the pipeline.

An experimental model of one such device[1] was built and tested at University of Michigan. Although the results were promising, it was felt that work should be concentrated on some more conventional type of analyzer since time was such an important factor.

For this reason, it was decided to use the conventional and proven procedure of removing a sample of gas containing particulate matter from the pipeline via a nozzle and then separating the particulate matter from the gas by means of a filter.

Isokinetic sampling . . . The importance of isokinetic sampling has been firmly established,[2-7] and without a doubt this feature had to be included in the design. The possibility of metering the nozzle flow and adjusting it to the proper value by comparison with the full pipeline flow was considered as a means of obtaining isokinetic flow (this is often done), but was ruled out for several reasons:

1. True isokinetic flow would be obtained only at those points where the local fluid velocity happened to be equal to the average fluid velocity.

2. Maintenance of isokinetic flow

PHOTOMICROGRAPH of filter pad shows particles trapped on fibers. Particle sizes ranged from 1 to 500μ and averaged about 75μ. Downstream samples contained no solid particles but did contain some oil. Fig. 6.

would be difficult with changing pipeline flow.

3. It would be impossible to even guess at the degree of stratification since this type of control does not permit determination of the pipeline velocity profile (stratification follows generally the velocity-distribution pattern).

4. Accurate maintenance of isokinetic flow would be predicated on the accurate measurement of both the nozzle and pipeline flow.

As an alternative (even though it involved many design problems under high-pressure conditions), it was decided to use two sets of directly opposed static-pressure taps on the inside and outside surfaces of the nozzle wall. Pressure readings from these taps could then be balanced to obtain equal velocities inside and outside the nozzle.

In addition, it was decided to incorporate a pitot tube into the design so that variations in velocity, and consequently particulate-matter concentration, could be detected. These velocity measurements would also serve as a double check on the pipeline and nozzle-flow metering accuracy.

Fig. 2 depicts the nozzle design and shows the actual arrangement of the pressure taps. A water manometer consisting of two high-pressure gage glasses mounted in parallel and interconnected at the bottom, was used to measure the velocity head and to "null out" the two static-pressure readings.

Nozzle diameter . . . There were several criteria used arriving at the nozzle diameter chosen:

1. It had to be small enough to permit sampling in lines as small as 8-in. diameter. Another advantage of a small nozzle would be the ease with which it could be inserted into the pipeline.

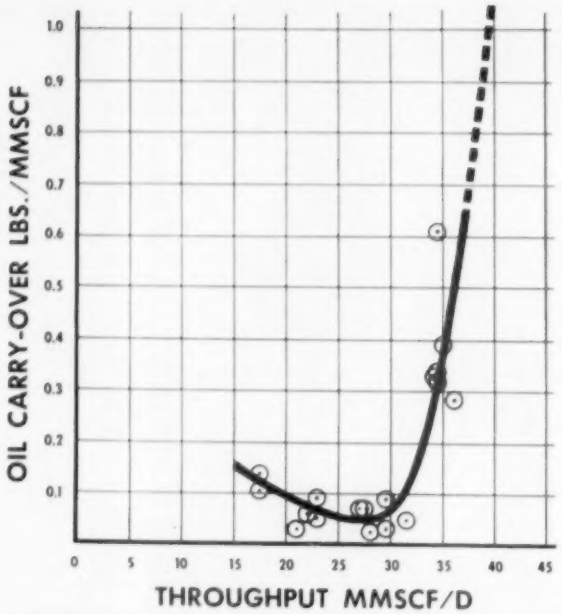
2. It could not be so small that the sampling time would be excessive.

3. It had to be large enough to eliminate the possibility of serious error due to nozzle-edge effects.

From the standpoint of versatility and sampling time (Criteria 1 and 2), it was felt that the ½-in. i.d. nozzle would be satisfactory, although the results obtained by at least one investigator[2] indicated that any nozzle diameter less than 1½-in. i.d. would cause excessive error.

However, other investigators[3 4 5] offered no objection to a ½-in. nozzle. One of the principal objectives of the large-diameter proponent was overcome by making the nozzle edge almost knife-sharp and then hardening it to prevent nicking since it was recognized that a blunt or nicked edge could cause serious errors with a ½-in. nozzle.

Inserting the nozzle . . . At first, it was felt that the simplest and most logical method of getting the nozzle into the pipeline would be to build a disklike section containing the nozzle and insert it between two pipe flanges. However, after discussing this matter with one of the major natural-gas pipeline companies, it was decided that insertion of a pipe spool containing the nozzle (Fig. 3) would be much more satisfactory.



CARRYOVER for gas scrubber under test remained low until the critical throughput of about 30 M.M.c.f.d. was reached. Tests were made over period of several weeks. Fig. 7.

From a testing standpoint this was more desirable since it permitted more leeway in the nozzle design. It also permitted the use of a diffusion plate or some similar device upstream of the nozzle to insure uniform flow in the sampling region. The possibility of inserting the nozzle via a hot-tap connection was considered, but since the effect of a short side branch was unknown and this was a development project, it was decided to start with somewhat idealized conditions and then make such simplifications as were possible.

The actual arrangement of the nozzle in the pipe spool can be seen in Fig. 3. It will be noted that a tube (to be referred to as the pressure tube) extends from the top of the nozzle upward through a seal and then to the outside of the pipe.

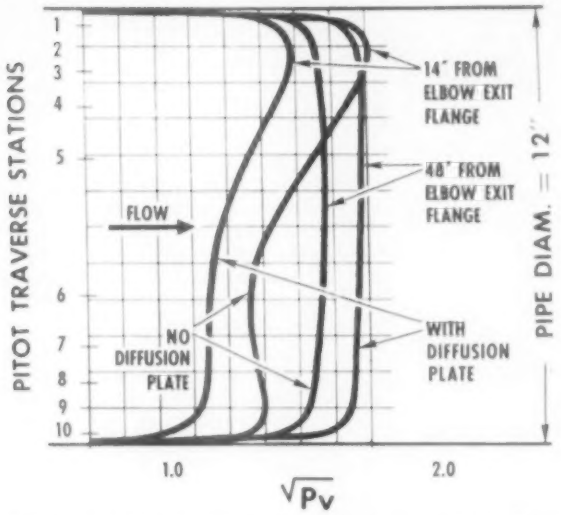
This tube served several purposes: (1) To stabilize the nozzle during traversing, (2) to act as a conduit for the tree nozzle pressure lines, and (3) to balance the pressure force acting on the sampling tube (tube carrying gas sample) so as to make manipulation easier.

The nozzle was installed in the pipe spool prior to its installation in the line under test by first inserting the nozzle through one end of this spool, lining up the sample flow opening with the seal, and connecting it to the sampling tube which was inserted through the seal from the outside. The pressure tube was inserted through the upper seal with the screwed flange removed (refer to Fig. 2). This flange was then attached to the tube and the assembly secured to the top of the nozzle. The positioning pins on top of the nozzle assembly assured proper alignment of the nozzle and pressure tube.

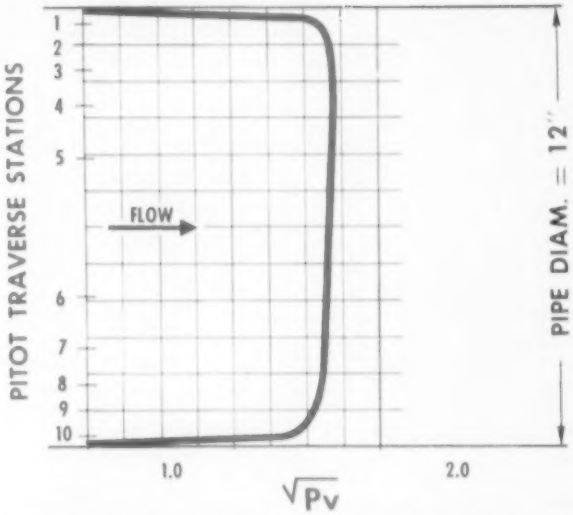
Stratification . . . It was realized that in many instances it would be necessary to take samples near pipe bends, especially when testing gas cleaners, where the only available test point is usually in a short aboveground approach run directly downstream of a 90° elbow. Many experimenters[2 5 6 7] and standards[3 4] recommend that this condition be avoided, but where impossible to do so further recommend that proper diffuser elements and means for traversing the pipe be provided. Both of these features were included in the design, as can be seen from Fig. 3. In addition, the fact that a velocity profile could be plotted was also helpful in analyzing the probable seriousness of stratification on any particular run.

Flow into sampling line . . . Some consideration was given to the possibility of inducing flow in the sampling apparatus by blowing the high-pressure sampled gas to atmosphere.

VARIATION OF VELOCITY DISTRIBUTION WITH NOZZLE POSITION



UPSTREAM TESTS with a pitot tube showed fairly uniform velocity across pipe 48 in. from 90° short-radius elbow but distorted profile at 14 in. Diffuser plate has 50 per cent free area. Fig. 8.



DOWNSTREAM measurement of velocity distribution with pitot tube was at 60 in. from 90° long-radius elbow. Flow was vertical compared with horizontal upstream flow. Fig. 9.

This system had some cost advantage, but it was eliminated as a possible solution for several reasons: (1) There would be considerable hazard involved in discharging to atmosphere when dealing with explosive or toxic gases. (2) there would be a possibility of freezeup at the exit of the nozzle line. (3) a considerable quantity of gas would be wasted since relatively long sampling periods would be required, and (4) accurate control of sampling velocity might be difficult.

Instead, it was decided to utilize a positive-displacement pump to move the sampled gas from the pipeline through the filter pack and metering run and then back into the pipeline. The required pump displacement was approximately 5 cu. ft. per minute and the casing-pressure requirement 1,000 psi. if used in a conventional manner.

Contact with several vendors indicated that such a pump would be expensive and was not readily available. For these reasons, it was decided to use a low-pressure pump and enclose it in a pressure vessel, as shown in Fig. 3. With the high-pressure requirement eliminated, a commercially available positive-displacement pump of the proper capacity was located with no difficulty and at a reasonable price.

Separation matter . . . There were many types of devices available for removing the particulate matter from the gas sample,[2-11] but it was felt that a mechanical filter was the most practical for this particular application. The design of mechanical filter finally decided upon was a plastic filter pack (Fig. 4) weighing approximately 100 g. and containing an Owens Corning AA Fiberglas pad as the filtering medium.

According to the manufacturer, a 1-in. depth of the filtering material used would remove, on a count basis, 99.4 per cent of all particles 0.3 μ and larger at a face velocity of 29 ft. per minute.

The design of the filter pack presented several problems, the most serious being the tendency of the gas to bypass the filter pad and pass between the pad and plastic wall. This condition was caused by the high-pressure drop through the pad resulting from the high pressures used.

Compressing of the pad edge between two flanges (Fig. 4), solved this problem. It was, of course, necessary to enclose the plastic pack in a high-pressure vessel, as shown in Fig. 3, and during removal of the pack to isolate this vessel from the high-pressure gas stream with a valve. Selection of this valve became quite a problem since it had to withstand relatively high pressures with no leakage and be of the "straight through" type of design.

Any change in flow direction would cause deposition of particulate matter at the discontinuity and consequently result in an error. This occurs because deposits build up and then are suddenly torn off, resulting in erroneous indications of concentration. The valve used was a high-pressure, plug-cock type utilizing O-rings for both the plug and stem seals.

A large turn-to-tube radius ratio was used for the one 90° nozzle turn which was required, and all joints in the sampling-tube section from the nozzle entrance to filter-pack entrance were made perfectly smooth. This was done to prevent any deposits of particulate matter in the section upstream of the filter pack. Examination of the nozzle and sampling tube following a long period of testing indicated no presence of such deposits.

Metering of gas sample . . . An orifice type of meter was used to measure the gas-sampling rate. This meter consisted of two ¾-in. corner-tap type of flanges, an orifice plate, and a recording pressure-measuring device for recording both the differential pressure and pressure level.

A recording instrument was chosen because the nozzle flow would vary with time as a result of maintaining isokinetic flow during traversing. In addition, slight line-flow variations would cause a variation in nozzle flow.

Operational Procedure

As mentioned previously, the nozzle was inserted into the pipeline by first assembling it inside a pipe spool and then substituting this spool for an identically sized one in the pipeline to be tested. This, of course, required depressurization of the system. A diffusion plate was used upstream of the nozzle when it was placed near a pipe bend.

The actual test procedure was as follows: The nozzle faced downstream until all preparations for the test had been completed. This included weighing of the filter pack and inserting it into the pressure container, starting of the sampling pump, and checking of all instruments and equipment to make cer-

tain they were in good working order. The nozzle was then positioned at the upper or lower traverse point and turned directly upstream (the pipe cross-section was divided into equal areas as recommended by various codes). Azimuth and position indicators, as noted in Fig. 3, were used to obtain accurate alignment and positioning of the nozzle inside the pipe.

The valve upstream of the filter pack was then opened and the nozzle quickly brought into isokinetic operation by adjustment of the sampling-pump bypass valve. Next, the nozzle was positioned at each of the predetermined sampling points. The nozzle remained at each of these points a length of time determined by the total sampling time.

The total sampling time was determined by the concentration of particulate matter in the gas stream and the minimum weight of material which could be measured accurately with the equipment at hand. In this case, an analytical balance with an accuracy of ±0.0003 g. was used. At the end of the test run the sampling valve was closed; the sampling pump was shut off; and the nozzle was again turned downstream in the event that additional runs were to be made later.

The filter-pack pressure vessel was quickly opened, the filter pack removed and weighed immediately. Covers were provided for the pack to prevent any liquid evaporation while transporting the pack to the scale location—usually only a matter of 1 or 2 minutes. After determining the change of filter-pack weight, it was then possible to combine this figure with the measured gas-sample flow to arrive at a particulate concentration figure.

Test results . . . The primary purpose of the tests, as pointed out previously, was to aid in the development of the sampling apparatus, although some interesting data were obtained concerning the type and quantity of particulate matter contained in natural-gas pipelines and some of the operating characteristics of gas scrubbers.

Particle concentrations in the upstream line varied from 0.0188 to 0.0432 lb. per M.M.s.c.f. during the testing period. This included both liquid and solid matter. Microscopic examination of the solid particles indicated their size to range from 1 to 500 μ with the predominant size being around 75 μ and only a few particles under 5 μ.

Visual observation under the microscope also showed the particles to consist principally of iron oxide, iron sulfide, sand, and oil. Fig. 5 shows four typical filter pads, and Fig. 6 is a photomicrograph of one of these pads.

The downstream samples contained practically no solid particulate matter but did contain some oil, the amount depending on the cleaner operating conditions. Fig. 7 is a graph of the results obtained on the downstream side of the cleaner during an extended period of testing.

Although there appears to be considerable spread in the data, it should be pointed out that these runs were made over a period of several weeks, and the sampling time varied from 1 to 3 hours purposely in order to check the effect of sampling time on accuracy. For the various sampling times used there did not seem to be any effect on accuracy which could be assigned specifically to this variable.

In two instances when runs of different time durations were made during the same day the agreement of results was excellent. This would indicate that changing line conditions from day to day has an effect on gas-cleaner performance. Since any change in line velocity would probably change both the quantity and size distribution of the particles suspended in the gas, this is to be expected.

The upstream data, of course, varied considerably from day to day although successive runs made on the same day checked very well.

It is interesting to note the type of velocity distribution which was obtained at two different distances from the 90° elbow with and without diffusion plates. As can be seen from Fig. 8 the velocity distribution at a distance of approximately 48 in. from the elbow was fairly good, and the diffusion plate did little or nothing to improve it.

However, the velocity distribution 14 in. downstream of the elbow was very poor and the diffusion plate helped considerably. This profile could have been made much flatter, of course, by using a diffusion plate with less free area. Since particle stratification is directly related to velocity distribution, it is obvious how important nozzle traversing can be.

By reference to Fig. 1 it can be seen that the upstream and downstream nozzles were placed in horizontal and vertical runs, respectively. The consistency of test results obtained in these two locations appeared to be about the same. Neither arrangement seemed to be superior to the other from an accuracy or convenience standpoint.

Suggested Improvements

A considerable number of improvements were made in the apparatus design as the testing proceeded. In general, the equipment was working very effectively at the end of the testing period. It was relatively foolproof and could be operated easily by a technician who had received a minimum amount of instruction. However, there are several items which, if changed, would make the equipment even more effective.

Only one manometer was used for "nulling out" both nozzles. It would be more desirable to have a separate manometer for each nozzle.

Since it is almost impossible to operate a water manometer under high pressures without occasionally blowing the water out of the manometer, it is suggested that a least ¼-in. lines be used on all pressure lines (smaller lines tend to "hold up" water), with drain cocks at appropriate points.

It was impossible to prevent some oil from entering the nozzle pressure taps, and for that reason it is suggested that some sort of liquid trap be inserted into each manometer line.

Although the high-pressure-gage-glass arrangement worked satisfactorily as a manometer, it was sometimes difficult to read because it was the reflex type. The transparent type would have been much more satisfactory.

The instrument and control board was not designed to permit measurement of total pressure drop across the gas cleaner under test. This feature should be incorporated in any such apparatus design.

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3.	8.10*	0.86
4.	7.50	0.08
5.	16.00*	1.30

* *These wells receiving "anti-corrosion" treatment. Replaced by Visco.*

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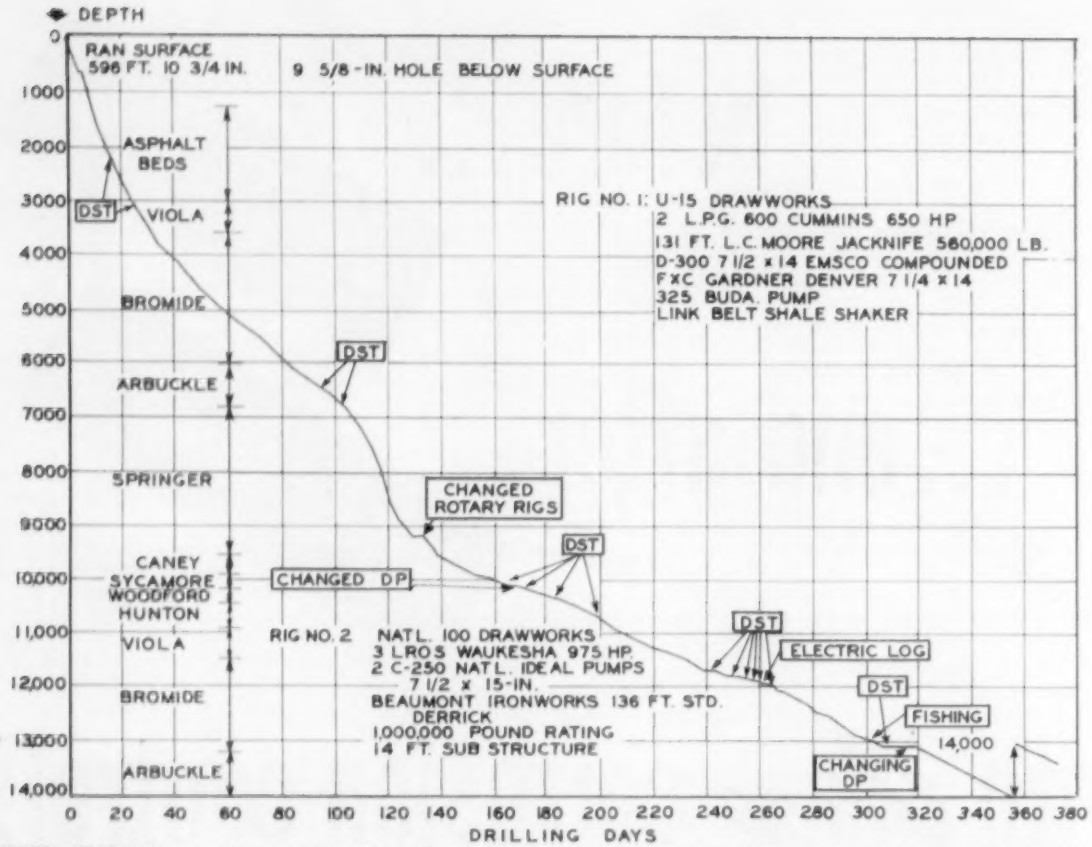


COMPLEX GEOLOGY gave the contractor little difficulty on this deep test in southern Oklahoma. Notice that the Viola, Bromide, and Arbuckle were encountered twice.

No trouble here as . . .

Oklahoma Deep Test Goes to 14,376 Ft.

by Everett A. Skarda

SOUTHERN Oklahoma presents a real challenge to the drilling contractors. Crooked holes, fault zones, and hard digging give the contractor more than his share of headaches. The north flank of the Arbuckle Mountains between Pauls Valley and Ardmore is typical of these complex areas. By careful attention to drilling techniques, Frankfort Oil Co. drilled its 2 Hale on the north side of these mountains with a minimum of trouble. The depth of 14,376 ft. was reached in 372 days. A total of 11 drill-stem tests were run with no difficulty. Eleven cores totaling 330 ft. of section were cut below 11,600 ft.

Mud . . . Native clay mud was used to 2,800 ft. For drilling below this point a caustic-quebracho 10 to 12 per cent diesel oil-emulsion mud with a water loss below 10 cc. A.P.I. was mixed. The viscosity was gradually increased to 100 to 200 seconds Marsh funnel. Total mud cost for the well at a depth of 14,376 ft. was less than $28,000.

Drilling . . . A total of 311 rock bits were used to reach 14,376 ft. Average bit weight in the deeper part of the well was 10,000 lb. and rotary speed was 42 r.p.m. The bits used in the "second" Arbuckle ran 70 to 90 hours, making 80 to 100 ft. of hole. Twelve 6-in. drill collars were used on the 3½-in. drill pipe. A 9-in. hole was drilled.

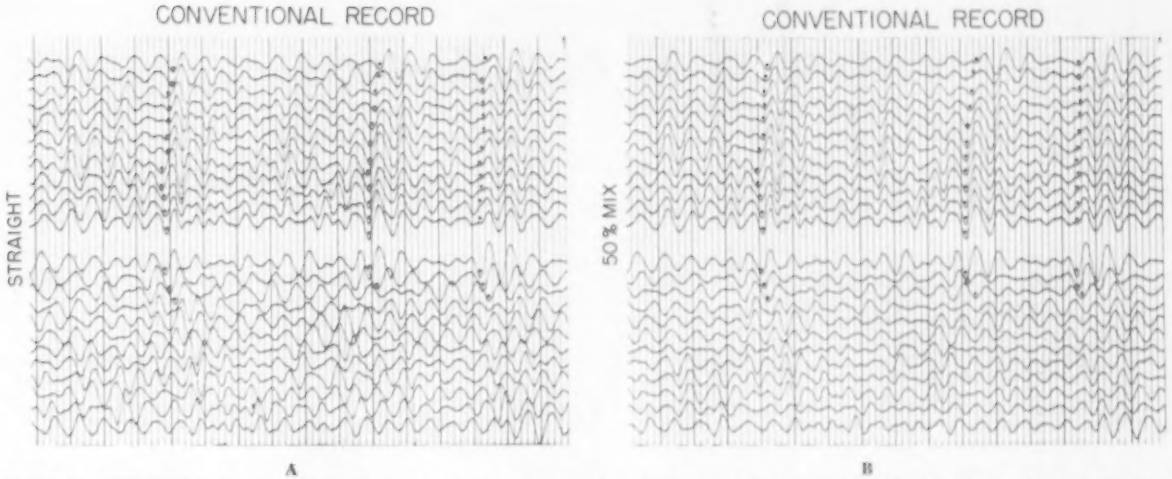
Discussion . . . A decision to drill below surface pipe without setting a further protective string was influenced by two factors. First, on the No. 1 well where 7-in. protective casing was run into the Viola, drilling out below the 7-in. was slow. Second, use of 9⅝-in. casing would have required using casing allocated to another well because of the casing shortage, curtailing Frankfort's drilling operations.

The Springer section through which the protective string was set in the first well had been cut without difficulty in this area using oil-emulsion mud with a water loss less than 3 cc.

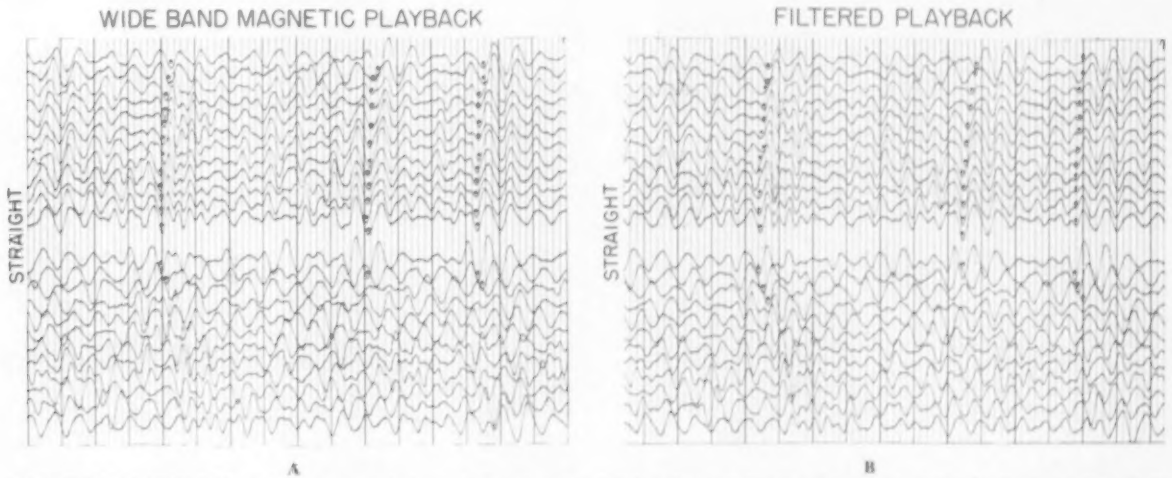
Difficulties . . . The one fishing job on the hole was due to fatigue failure of the drill pipe. The string parted twice and the remainder of the time was spent circulating at 10,000 ft. waiting for new drill pipe to arrive on location.

The hole remained clean and no difficulty was experienced in any of the drilling, coring, or testing operations.

The author is chief production engineer, Frankfort Oil Co., Bartlesville, Okla.



PICKING THIS RECORD is a real problem. Notice that the reflections in the upper half cannot be identified in the lower half of the record. A is "straight," B is "mixed." Fig. 1.



MAGNETIC PLAYBACKS of the same record shown in Fig. 1. Even filtering does not improve the record quality in the lower half of the record, B. Fig. 2.

SEISMIC-MAGNETIC DATA PROCESSING

. . . It's a new concept—and it's proving a boon in helping geologists to interpret the geophysicist's language

by R. C. Dunlap, Jr.

THIS year may be the most important in the history of geophysics since the inception of the reflection seismograph. For the past several years research and development groups of the industry have been working intensively on a broad and coordinated program.

Perhaps the most widely used term to describe this broad development in the seismic field is "seismic-magnetic data processing." In referring to this as a new concept, we should keep in mind that certain elements have been recognized for a number of years. For example, Frank Rieber (1937) presented a method of reproducible recording in the late 1930's. In 1951, H. R. Prescott, of Continental Oil Co., discussed the use of record sections. More recently the Reynolds Plotter has provided the means for accomplishing some of the objectives we have set before us (Stonedale, 1955).

A search of the literature should reveal similar examples. However, the term new concept is justified because of the integrated and broad-scale advances of seismic-magnetic data processing.

Author is with Geophysical Service, Inc., Dallas. S.E.G. Presidential address presented at the forty-first annual meeting of A.A.P.G. and S.E.P.M. Chicago.

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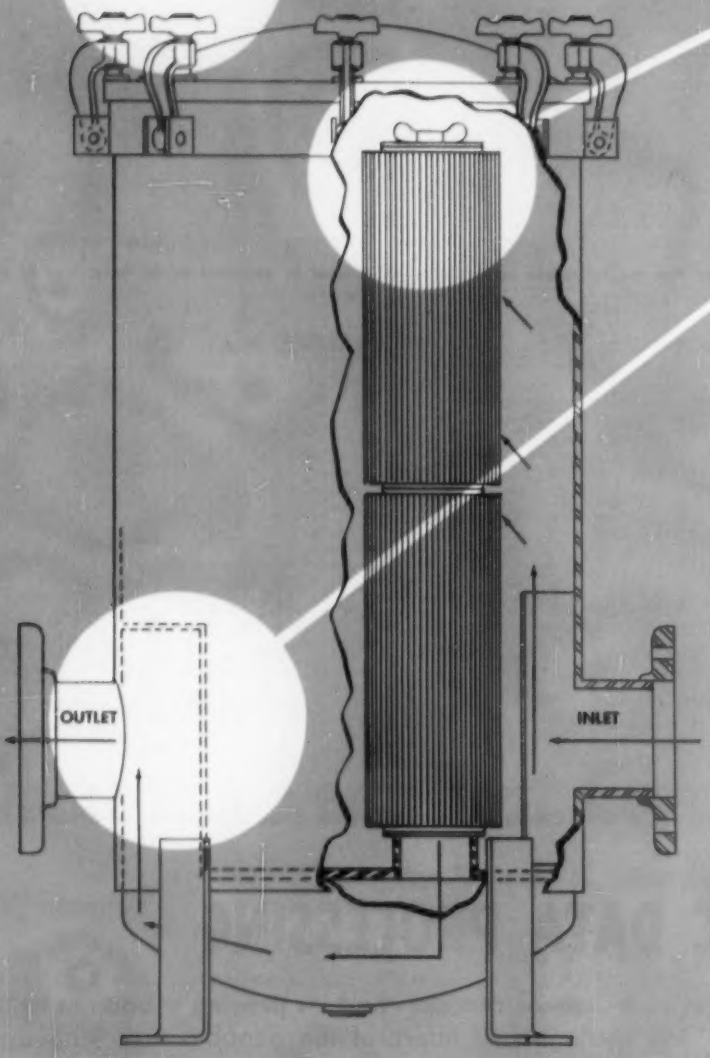

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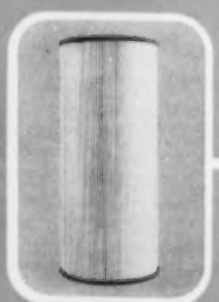

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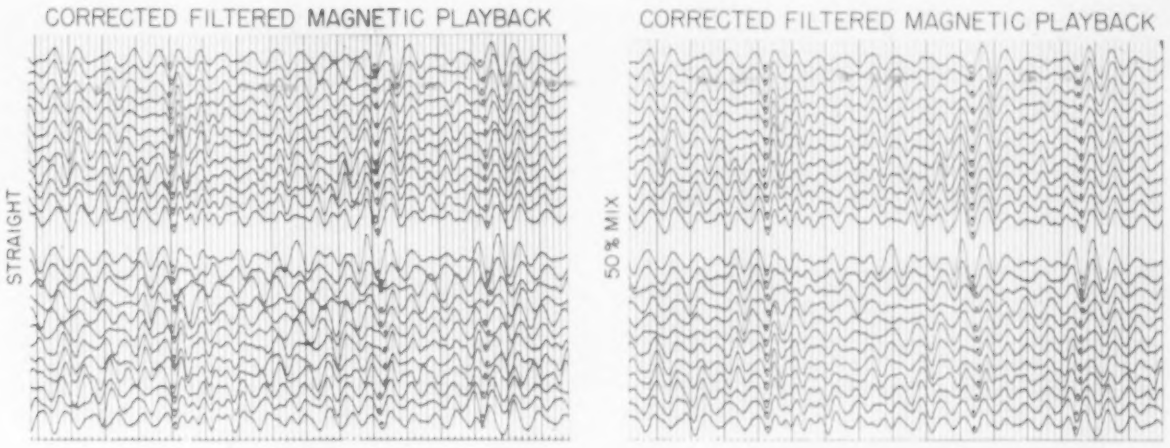


RECORDS obtained through magnetic playback are improved markedly by applying corrections for normal moveout and the effects of near-surface conditions. Fig. 3.

Recording and Storage

In considering recording and storage of basic data, the conditions under which seismic information has been recorded must be considered. The field technician has been forced to determine in advance all instrument settings and recording techniques because once the shot was recorded, nothing he could do would alter the basic data on that particular recording. His advance judgment, of course, was based on experience and field experimentation in the area.

In field experimentation, however, it generally has been impossible to introduce one variable at a time. A given shot had to be recorded with sesimometer outputs either mixed or unmixed, with either one filter setting or another, and with a single-gain control characteristic. The choices had to be made in advance of shooting and applied simultaneously. In some cases a desirable technique could not be utilized because of some obstructing condition.

Under such conditions, undesirable compromises in recording techniques have been necessary. Therefore, our evaluation of field experimental work often has been qualitative rather than quantitative and, in some cases, even erroneous.

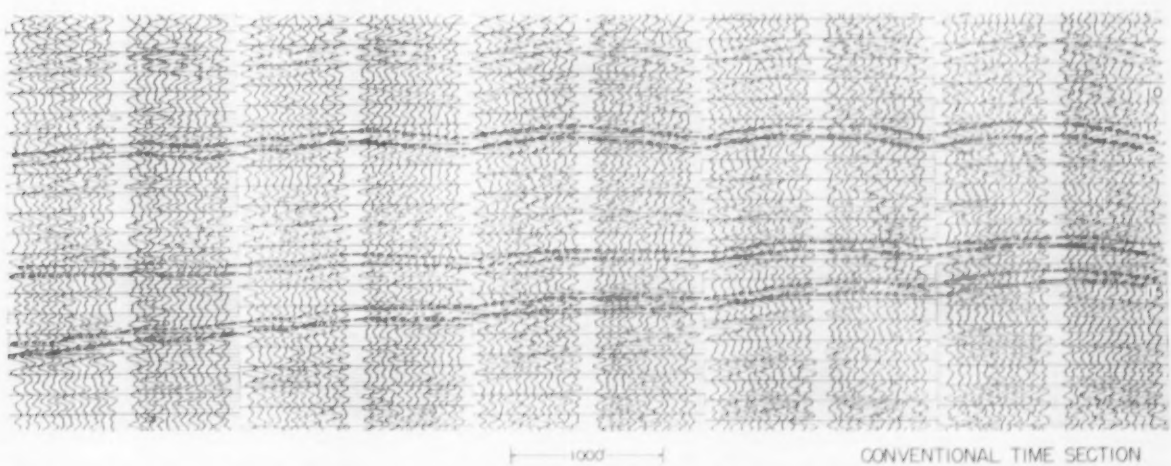
In seismic-magnetic processing, the primary equipment is a recorder, which stores information from the shot on a magnetic tape or disk. This recording method permits replaying the data through standard as well as special equipment more than once.

This reproducible characteristic is most important. It is now possible to record the shot with a minimum of predetermined recording techniques. After the recording is made, the reproducible characteristic allows the introduction of one variable at a time. Thus, we can evaluate the effect of the single change.

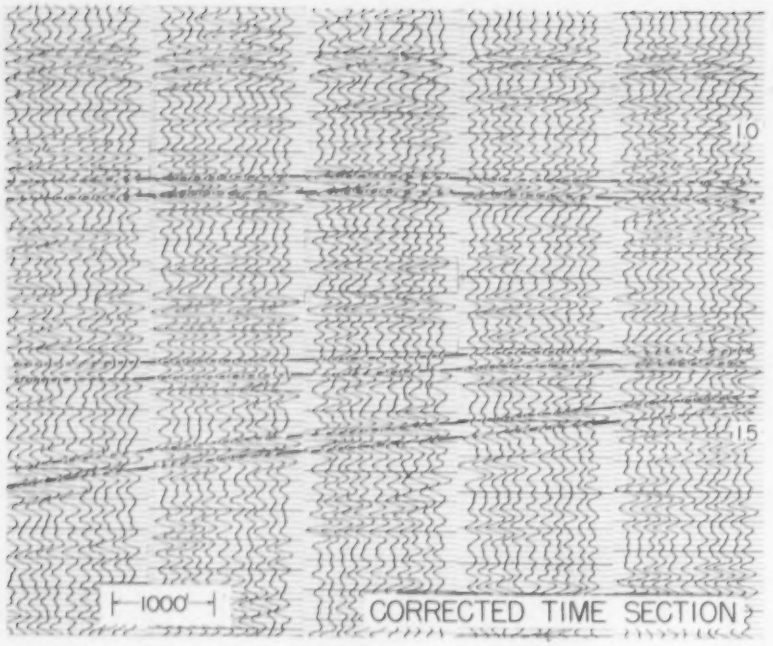
Analysis of Seismic Data

This brings us to a second point—analysis of the recorded data. Here, we add special equipment to the magnetic recorder and standard seismic instruments. This equipment helps us make, on a production basis, substantial improvements in the quality of seismic information. In this article only a few elementary examples which illustrate in general the improvement of data with seismic-magnetic processing are given.

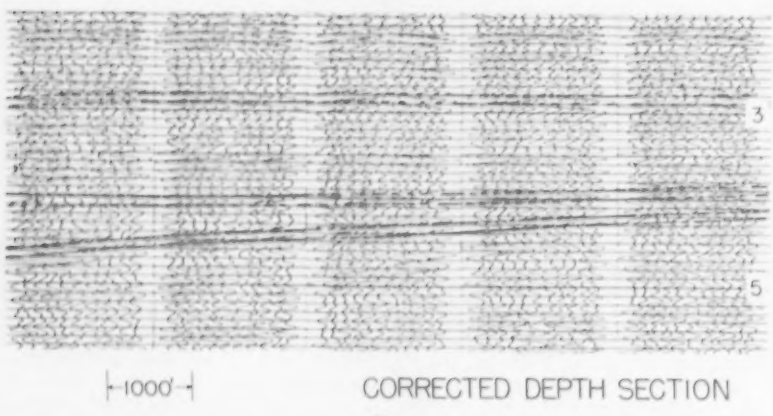
In Fig. 1 portions of seismograms, as they appear in a conventional recording, are shown. A considerable amount of field experimental work has been conducted in advance of this shooting, and the best-known field techniques were employed. In the first illustration the recording is straight—one group of geophones activates a single trace. In the second illustration a mixed record combining two groups of geophones to



THE CONVENTIONAL SEISMIC RECORD section is difficult for the geologist to evaluate quantitatively although the general record quality is good. Fig. 4.



A



B

THE MAGNETICALLY PROCESSED time section shows (A) considerable improvement over Fig. 4. And the magnetic depth section (B) is even easier to understand for the geologist who thinks in terms of feet rather than milliseconds. Fig 5.

activate each trace is shown. Except for this difference, the data are identical.

Even from a casual study, it is apparent the records contain good reflected energy, for several reflections can be followed easily across the top portions of the seismograms. The lower halves of the recordings, however, present the geophysicist with some very real problems.

Although we know that near-surface conditions vary over this portion of the spread, it is difficult, if not impossible, to follow the reflections across the entire record. The mixed seismogram in Fig. 1B does not reinforce the desired signals because of an out-of-place relationship apparent on the straight record.

Handling the magnetic tape . . . Next we will show how these same data are handled by seismic-magnetic data processing.

First, the technician in the field makes a recording on a magnetic medium using wide-pass-band filtering. A relatively unfiltered playback of a magnetic record appears in Fig. 2A.

This playback resulted from the same shot as the conventional record in Fig. 1. A wider pass-band filter was utilized on the magnetic record but the recording techniques are the same. Since filtering is not critical in the area, differences between the two examples are minor.

Fig. 2B illustrates another playback of the same magnetic record. Here the broad-band recording has been replayed through the same filter as was used for the recording in Fig. 1. Therefore, the two seismograms are essentially identical.

In areas where filtering is critical, the broad-band magnetic recording can be replayed as many times as desired, each time through a different filter. Thus, the optimum filter can be determined from a single shot.

With the next step (Fig. 3A), a marked improvement is noticed in the magnetic playback. To obtain this recording, we have replayed the data through special equipment which permits us to remove both the effects of variations in near-surface conditions and the normal moveout of the reflections.

When we speak of removing normal moveout, we are correcting all traces to a common shotpoint-to-geophone distance. The application of the normal moveout and near-surface corrections now provides a seismogram in which the difference in reflection time across the record is caused by the dip of the reflecting horizon.

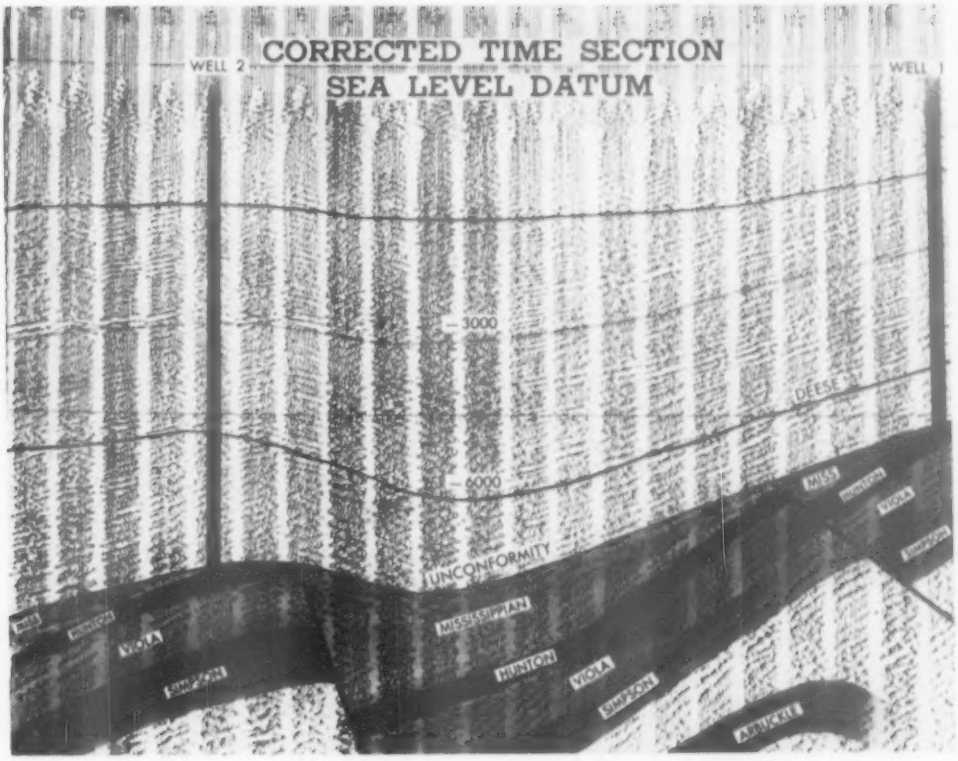
We now are able to follow the three reflections across the entire seismogram. Since the desired signals now are in phase, we can mix the traces effectively and determine if this technique offers additional improvement.

Fig. 3B shows the effect of mixing applied to the corrected and filtered magnetic recording. Note how this compares with the conventional mixed recording in Fig. 1B. These improved results illustrate the simpler techniques used in seismic-magnetic data processing to analyze and improve the quality of basic data.

Presentation of Seismic-Magenetic Data

Thus far we hace discussed the recording and analysis of seismic data. This leads us to a third point—presentation of seismic data for geologic study. This is the most important because seismic-magnetic data processing permits us to present information in a form that will insure close coordination between the geophysicist and geologist.

This form permits both to give all their attention to subsurface interpretation. The subject of greater coordination of geology and geophysics has been discussed many times. When the geologist and geophysicist analyzes a group of seismograms, the geologist often feels he hears too little about the subsurface and too much about near-surface velocity changes, surface corrections, peculiarities in shot-to-geophone distances, and a vast array of details and problems about instrumentation. Finally when the subsurface is discussed, dips and depths often are expressed in time, when the geologist is interested in feet.



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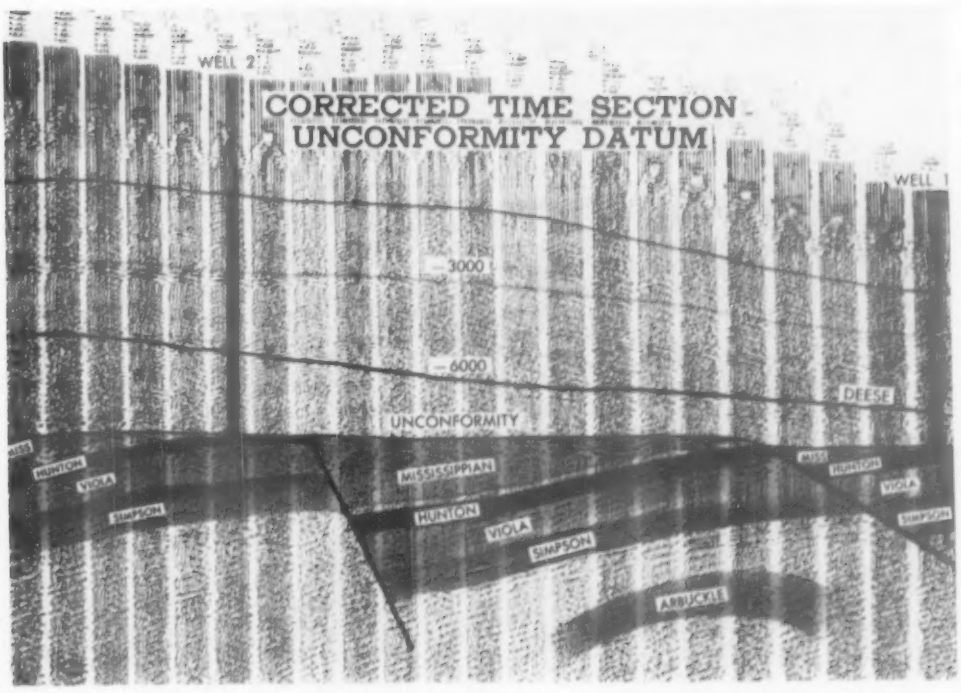

B

THE TWO CROSS-SECTIONS of the same profile show the versatility of the magnetic processing of seismic data. In A the datum is sea level; in B the datum is the unconformity at the top of the Mississippian. Fig. 6.

Under these conditions, the geophysicist often completes his interpretation independently. The geologist utilizes the interpretation without a real feel for the basic data involved. The result is a situation analogous to that of the geologist who must compile well data interpreted by others without personally studying the logs, samples, and other basic material.

Seismic - magnetic data processing offers a definite remedy for this situation.

Record cross-sections... Fig. 4 shows five conventional continuous seismograms recorded with techniques believed optimum for the area. The quality of these data is much better than in our previous illustrations, for a number of reflections can be followed across the seismograms. The strips bounded by dashed lines enclose three key reflection horizons which illustrate the correlation.

The geologist or geophysicist studying the data would, of course, gain an immediate impression of the general quality and would notice the unconformity between the deeper horizons.

It would be difficult, however, for either of them to make a quantitative analysis of the subsurface from these data alone. Normal movement, near-surface corrections, and other factors must be considered before specific conclusions are reached. These factors certainly can be considered but

even with good data, the geologist will encounter difficulties. Reference to numerous graphs, charts, and computation sheets will be distracting.

Fig. 5A contains the same basic data. The various data-processing steps illustrated previously have been applied. At the time this illustration was prepared, equipment utilized was limited in its normal moveout correction feature. The normal moveout of the intermediate reflection was applied to the entire record, resulting in some bowing of the shallower reflections. Now, improved equipment which no longer has this limitation is available.

The difference in presentation of data in the two figures is apparent. The interpreters, whether geologists or geophysicists, working together or separately, can give undivided attention to subsurface relationships when studying magnetically processed data.

Interpretation often may be assisted if a record section is presented in depth rather than time. For this purpose, a seismic camera is employed to produce seismograms in time or in depth as desired (see Fig. 5B). Data are the same shown in Fig. 5A except the horizontal lines show depth in intervals of 100 ft.

On each seismogram, reference pips are shown at .01 second intervals. The velocity function employed can be changed from one area to another, and the seismograms may be replayed when more accurate velocity information is available.

The depth-record section, now on a one-to-one scale, lets the interpreter simultaneously study seismic data and quantitatively evaluate subsurface relationships. The dip on the deep horizon across this section amounts to 530 ft. This can be determined by inspection.

Now that we have examined portions of seismograms in detail, we will view a complete time-record section processed in two different ways.

These illustrations (Figs. 6A and 6B) are from a paper by Glen M. Conklin of Sun Oil Co. These records were taken in a most interesting and complex area, the Marietta basin in Oklahoma.

The flexibility provided by the techniques discussed are interesting. The record section in Fig. 6A is based on a sea-level datum. Fig. 6B shows the same seismograms processed to provide a record section with the unconformity at the top of the Mississippian as a level-datum plane.

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Prescott, H. R., 1951, Seismic Record Section: Geophysics, Vol. 16, pp. 613-625.

Rieber, Frank, 1937, "Complex Reflection Patterns and Their Geologic Sources," Geophysics, Vol. 2, pp. 132-160.

Stonedale, R. M., 1955, "New Instruments in Critical-Area Prospecting," World Petroleum, Vol. 26, No. 3, p. 77.

Equipment life is lengthened with simple changes

SEVERAL interesting on-the-job improvements have been made at Skelly Oil Co.'s 7,000-bbl. Longview, Tex., refinery.

They include modifications to lengthen the run of a thermal unit heater and a method to keep condensers from fouling.

Thermal heater . . . A simple modification doubled the run life of a heater on a thermal cracking unit. The last tube in the heater provides a critical area in its operation. During a normal run, coke deposits in this tube would cause the pressure drop to build up rapidly, limiting the on-stream time of the heater.

A 1-in. line was tapped onto the discharge of the unit charge pump. This 1-in. line was then tied in just upstream of the last tube of the heater where coke laydown was severe (Fig. 1). A gas-oil quench was then turned into this tube. With this in use, the coke laydown was minimized. Hence, the pressure drop assumed a gradual rather than rapid buildup. And, as a result of this simple change, run life was actually doubled.

Algae buildup . . . A simple method is being used to clean condensers which are susceptible to algae and silt buildup as a result of low velocities.

On some water-cooled condensers in a reforming unit, the accumulation on the tubes gradually reduced the cooling effect. This required frequent pulling of the bundles to remove this fouling medium.

A tap was made upstream of the condensers, to connect the fire-fighting water system to the cooling water line to the condensers. Appropriate valving was included in this modification.

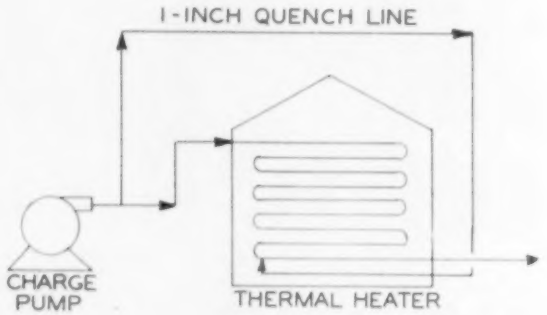
HIGH-PRESSURE WATER stream is used to clean shell side of condensers at refinery. Fig. 1.

Now when algae and silt accumulation builds up to an undesirable level, the cooling water is cut off and high-pressure (150 psi.) fire-fighting water turned into the condensers. The force of the water passing through at this pressure is sufficient to knock accumulation off the tubes and return them to normal heat-exchange performance.

The water containing the algae goes to the cooling tower. Once the tubes are clean, the fire system is cut off, the cooling water turned on, and the condensers returned to normal service.

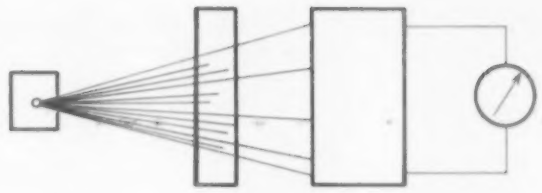
Acknowledgments

Cooperation of the management of Skelly Oil Co. and J. D. Waddell, refinery superintendent, and J. H. Ashmore, maintenance foreman, is gratefully acknowledged.



COKE LAYDOWN was minimized and run life was doubled for a cracking heater with a gas-oil quench.

Fig. 1.



by Frank J. Piehl

Here's the principle ↑ . . .

Fig. 2.

. . . and here's the instrument →

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Determine Hydrogen Content in a Hurry

Lab results point to success on a commercial scale

STRONTIUM-90 is an excellent source of beta rays for determining the hydrogen content of liquid hydrocarbons. The analysis technique utilizing this material is being used successfully in the laboratory, and is beginning to find plant application.

This radioactive isotope is inexpensive, as are many other radioactive isotopes which are available as byproducts from nuclear reactors, or which can be manufactured by irradiation.

The use of strontium-90 enables a fast, accurate determination of hydrogen in hydrocarbon liquids. This is in decided contrast to the slow and tedious conventional methods which require skilled technicians.

Analysis for hydrogen is important when the refinery process changes the hydrogen content of the stock. For example, catalytic reforming removes hydrogen from paraffins and naphthenes to produce aromatics. Catalytic hydrogenation adds hydrogen to olefins to form paraffins and to aromatics to form naphthenes. Solvent extraction selectively separates aromatic hydrocarbons from paraffins of higher hydrogen content. Analysis for hydrogen is important in each of these cases.

Author is with Standard Oil Co. (Ind.), Whiting, Ind.

Principle . . . Fig. 1 illustrates the principle of hydrogen determination. Strontium-90 emits beta rays that pass through the hydrocarbon sample. They are slowed down, mainly by collisions with electrons, and some are stopped. Hydrogen contains about twice as many electrons as equal weights of carbon and other light elements and consequently stops about twice as many beta rays. The number of beta rays that pass through the hydrocarbon, reach the detector, and actuate the indictator therefore decreases as hydrogen content of hydrocarbon increases.

Fig. 2 shows a commercial instrument developed in our laboratories and employing these principles.[1,2] The strontium-90 emits two beams of beta rays. One passes through the sample; the second is a reference beam. The instrument thus operates on a null principle for maximum stability and sensitivity. It is rugged, self-contained, and shielded so that no significant radiation reaches the operator.

Operation . . . Operation of the instrument is simple and rapid. Analyses can be performed by nontechnical personnel after brief training. An analysis accurate within 0.03 per cent hydrogen can be completed in 20 minutes or less, whereas conventional methods require about 2 hours and are accurate only within 0.2 per cent hydrogen.

All types of liquid hydrocarbons can be analyzed. Even viscous samples that do not flow into the instrument can be diluted with less-viscous hydrocarbons. Although large amounts of nitrogen,

oxygen, or sulfur would cause errors, hydrocarbons from petroleum seldom contain enough.

Advantages of the instrumental method make possible a broad spectrum of applications from laboratory bench work to process monitoring. The instrument has been an invaluable aid in laboratory and pilot-plant studies, where frequent changes in feeds and in process conditions lead to a variety of products that can best be analyzed directly by determining hydrogen. It should also become so in the refinery.

Applications

In catalytic reforming, change in hydrogen content is the most direct measure of dehydrogenation. In commercial units, gasoline quality is usually determined directly as octane number. However, if octane-number improvement were correlated with change in hydrogen content, an automatic beta ray instrument would continuously monitor product quality. The same instrument would also conveniently measure hydrogen production.

Catalytic hydrogenation is receiving increased attention in refinery processing. Cheap hydrogen, available as a byproduct of catalytic reforming, makes several hydrogenation processes economically attractive. Hydrogenation of virgin gas oil, coker gas oil, and heavy catalytic cycle oil makes these stocks better feeds for catalytic cracking. Hydrogenation of heating oils, diesel oils, and jet fuels remove contaminants and raises burning quality.

As a wider variety of these stocks are hydrogenated, the common denominator of hydrogen content will provide the simplest and most direct method of monitoring the process.

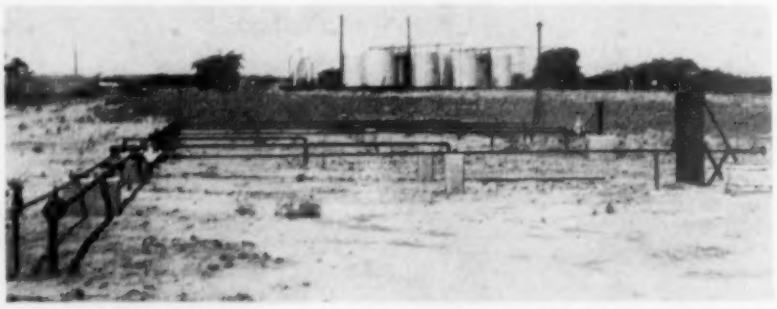
In solvent extraction, hydrocarbons are separated into hydrogen-rich and hydrogen-poor fractions. Extraction of gasoline removes low-octane paraffins from aromatics, whereas extraction of lubricating oils removes aromatics that cause poor stability. Both processes can be followed directly by measuring change in hydrogen content.

Hydrogen content can be used not only to monitor refinery processes but also to control product quality. For example, heat of combustion, smoke point, and tendency of jet fuels to form carbon deposits correlate with hydrogen content. Thus, a single determination of hydrogen content measures how much energy a fuel will deliver and predicts how much carbon will be formed when it is burned.

References

1. Jacobs, Lewis, and Piehl, Anal. Chem., 28, 324 (1956).
2. Central Scientific Co., Bulletin No. 115, Chicago, 1956.

ON THE JOB . . . . . IN THE PLANTS



FIRE CONTROL is practiced on this training ground at Phillips' Bradley gasoline plant.

Training grounds vital to safety program

PHILLIPS PETROLEUM CO.'s natural-gasoline department people consider the fire-control and extinguishment training grounds provided to train personnel in fire fighting as vital to their operations. And they consider the equipment used is as necessary as any operating equipment in their natural-gasoline plants.

They presently have 23 training grounds fully equipped such as the one shown at the new Bradley gasoline plant in McClain County, Oklahoma. Employes are trained on these training grounds in the control and extinguishment of various oil, gasoline, wood, natural gas, and L.P.-gas fires under assimilated conditions which might occur in routine plant operations.

The employes learn the techniques used in the control and extinguishment of fires as well as the limitations of the extinguishers that are provided and strategically located throughout the plants. The fire-fighting equipment employed in the plants is dry chemical, carbon dioxide, foam, and water fog.

Plant operating personnel receive this training at least once a year, gang and maintenance crews a minium of twice a year, since the labor turnover is greater in this group and operating jobs are filled from this group.

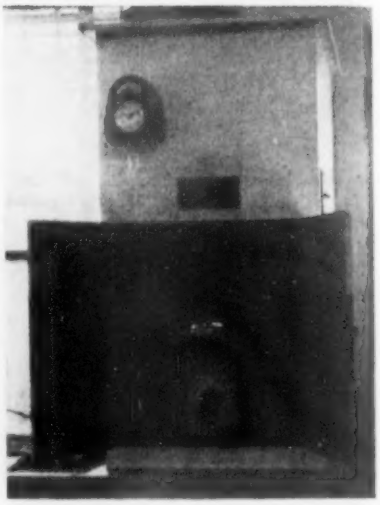
It is Phillips' desire for operators in its natural-gasoline plants to have the training before they start on operating jobs. Only through the actual use of the various pieces of fire control and extinguishing equipment can the employes gain confidence in it.

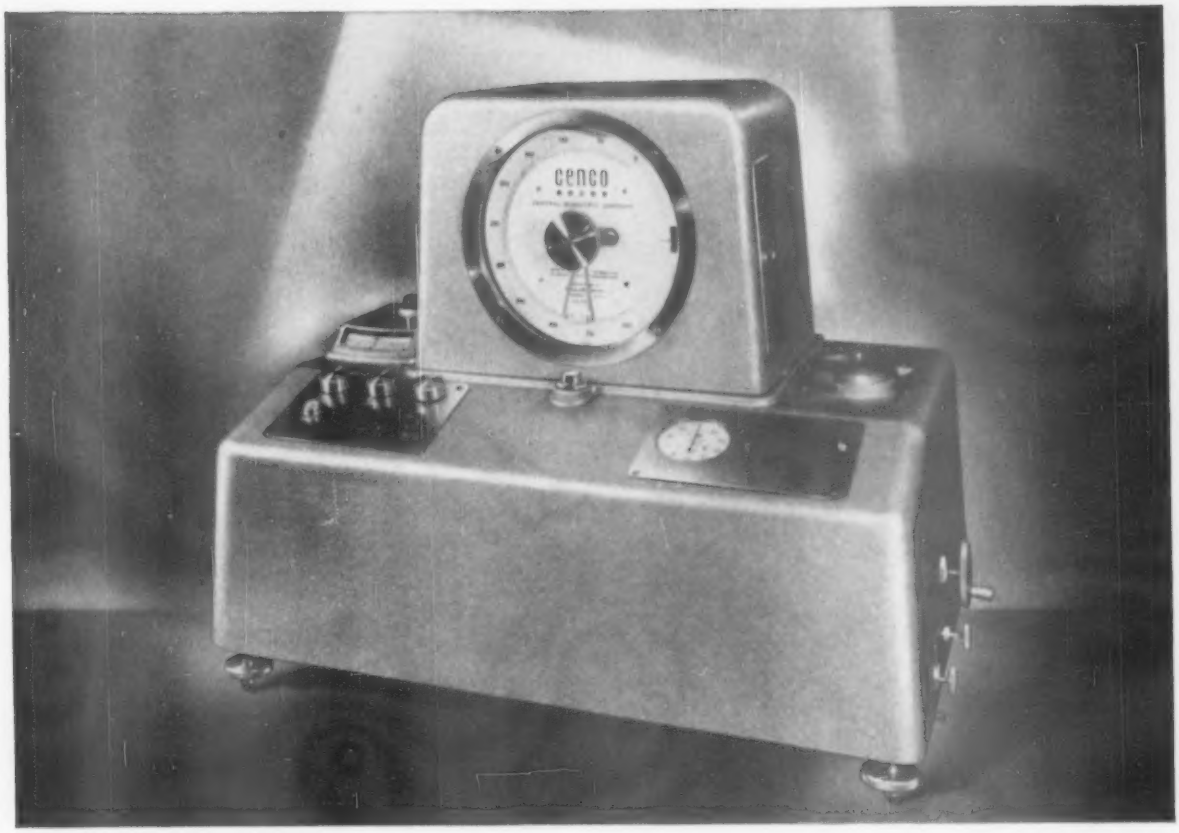
Airtight wooden cabinet holds equipment

AN airtight wooden cabinet is being used to improve the running of flash-point tests at Hunt Oil Co.'s gasoline plant near Bernice, La.

The cabinet is big enough to accommodate flash-point equipment within its interior. This interior, incidentally, is painted black. It thus affords an excellent contrast with the flame and makes it easy to detect the flash point with accuracy.

A light is located within the cabinet to facilitate handling of equipment. When running tests, double doors are left open to provide access to the equipment. Should the sample cause a small fire to begin, the doors may be closed to cut off air and oxygen, thus snuffing out the blaze.





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Cenco Beta Ray H/C Meter

This instrument utilizes the absorption of beta rays as a means of measuring the percentage of hydrogen, or the hydrogen-carbon ratio, in liquid hydrocarbons. It is a practical precision instrument designed for use in research as well as in product control and routine analysis. It is the fastest known means of obtaining this important information, doing the entire job in a matter of minutes instead of the hours required by combustion train methods.

The Cenco Beta Ray H/C Meter is accurate to within 0.03 weight percent hydrogen. Calibration is independent of pressure changes in ionization chambers since they share a common supply of gas. Temperature changes do not affect measurement since both specific gravity and beta absorption measurements are made automatically and at the same temperature. Adequate shielding makes the instrument safe from radiation hazards.

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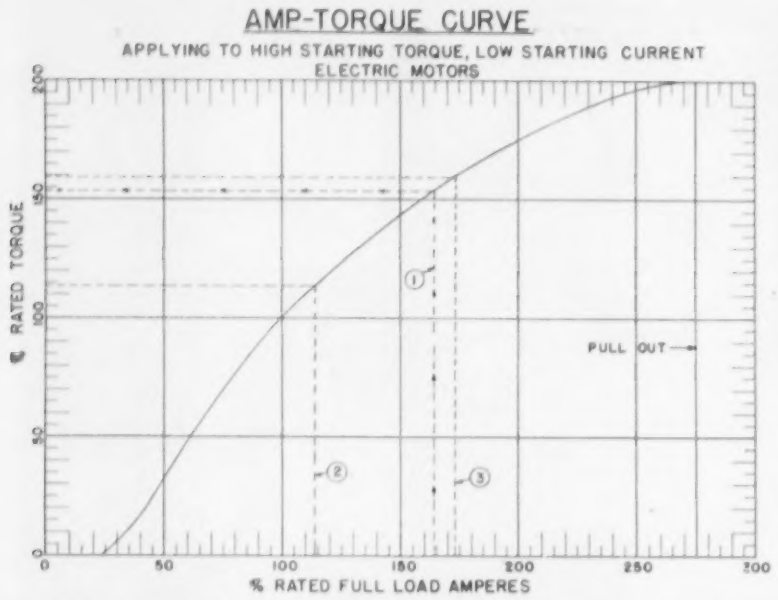

TORQUE CHART and four items of data simplify calculations for finding gear-teeth loads of pumping units while running on electric power.

How to find torque loads on pumping-unit gears

FINDING the torque load on the gear teeth of pumping units running on electric power is relatively simple with this method devised by Continental Supply Co.

For this method of torque calculation, four items of data besides the accompanying chart are required:

1. Secure the peak ampere demand being required by the motor. This can be done in several ways—by accurately reading the needle of a clip-on hand ammeter, or by reading the chart taken by a recording ammeter. In any case, accuracy of reading will give the proper results desired.

2. Secure from the name plate of the motor the full-load ampere rating, the full-load r.p.m., and the nominal horsepower.

3. Measure the size of sheaves and figure the drive ratio of the V-belt drive.

4. Find out the ratio of the gear reducer from its name plate.

The third and fourth steps can be combined by dividing the actual r.p.m. of the motor by the strokes per minute on the well. This gives the over-all ratio.

With the above data in hand, proceed as follows:

1. Solve the following formula to find out the rated torque of the motor.

$$\text{Rated torque} = \frac{\text{Nominal hp.} \times 63{,}000}{\text{Full-load r.p.m.}} = \text{inch-pounds torque}$$

2. Solve for the percentage of full-load ampere rating that the motor is actually drawing.

$$\text{Per cent full-load ampere rating} = \frac{\text{Peak ampere reading}}{\text{Full-load amperes}} \times 100$$

3. Now, refer to the chart. Start at per cent full-load ampere figured in Step 2. Go up until the curve is reached and from that point proceed horizontally to the per cent rated torque that the motor is putting out.

4. Now multiply the rated torque from Step 1 by the per cent of rated torque from Step 3. This gives the actual torque output of the motor.

5. Multiply this actual motor torque by the drive ratio and the ratio of the gear reducer. This product is the inch-pounds torque being carried by the gear teeth. Alternately multiply the actual motor torque by the over-all ratio of the pumper to secure the torque loading of the gear teeth.

Example

Data . . . 11-DE57-F with 10 hp., 1,200 r.p.m., 220-440-volt G.E. oil-field pumping motor. Ampere rating (full load) is 15 at 440 volts and 30 at 220 volts.

Full-load r.p.m. = 1,155.
Gear ratio = 30.1 to 1.
Unit sheave diameter = 16 in.
Motor sheave diameter = 7½ in.
Strokes per minute = 18.
Ampere peak reading (taken on leads while unit was in operation) = 17.

Solution . . . (No. 2 on chart):

1. Rated torque $= \frac{10 \times 63{,}000}{1{,}155} = 545$ in.-lb.

2. Per cent full-load ampere rating $= \frac{17 \times 100}{15} = 113$

3. From curve find that motor is putting out 112 per cent of rated torque.

4. Actual torque = (1.12) (545) = 610 in.-lb.

5. Multiply the torque being put out by the motor by the drive ratio and this product is multiplied by the gear ratio to find the torque loading on the gear teeth.

Gear teeth torque = (610) (16)/7.5 (30.1) = 39,200 in.-lb.

This method has been found to give very close agreement with results obtained by dynamometer analysis.

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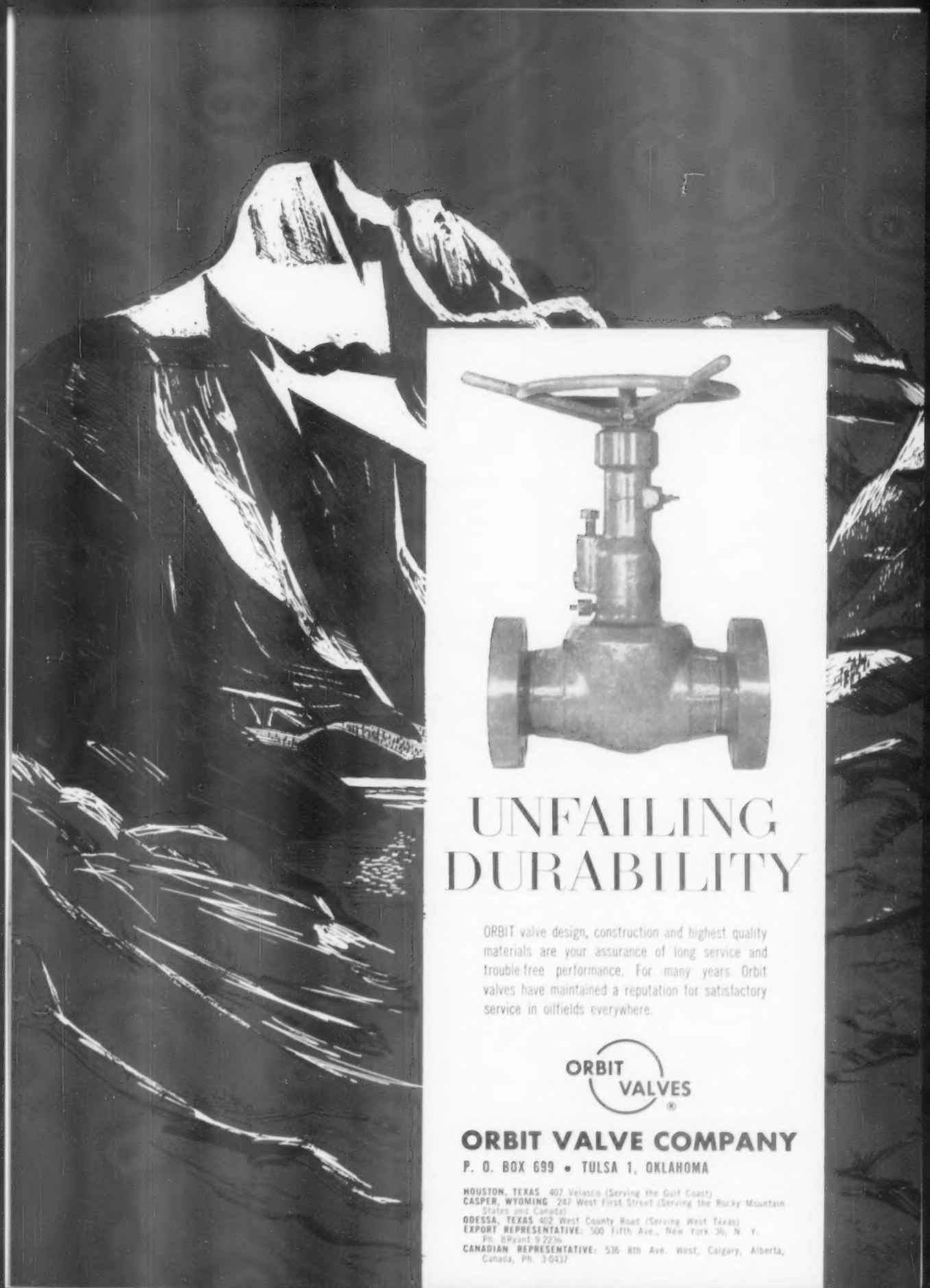

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LAKE CHARLES REFINERY has about 175 storage tanks with bare metal on a sand base. Cathodic protection is applied to both tanks and lead sheaths of power cables by means of rectifiers and graphite anodes.

Cathodic Protection at Lake Charles

by G. H. Hill

THE cathodic-protection systems at Cities Service Refining Corp.'s Lake Charles refinery were installed in 1954, and consist of one system for the lead-sheath power and control cables, and another for the underground piping and storage tanks.

The lead-sheath power and control cables are installed in a duct system of 5-in. Orangeburg fiber conduit encased in concrete. The main-duct system is on the north, east, and south borders of the refinery area, totaling approximately 10,000 ft. of duct line.

The storage tanks are divided into three groups. The intermediate tank farm is in the center of the refinery area and consists of approximately 65 tanks and 6 spheroids and associated piping. The crude tank farm on the west borders and consists of approximately 75 tanks of various sizes and associated piping. The finished-product tank farm on the south border consists of approximately 30 tanks and associated piping which is connected to the dock for shipping by tankers.

Tank bottoms are bare metal installed on a sand base, but the sand fill was contaminated by clay during construction. The majority of the piping is aboveground except at road crossings and within the battery limits of each unit. The underground piping is coated and wrapped.

Tank tests . . . Prior to the installation of the power cable and tankage systems some preliminary studies were made on tank using 24 magnesium anodes packed with a specially prepared, quick-wetting backfill in a permeable cloth sack. The anodes were installed in groups of three equally spaced around a 110-ft.-diameter tank about 3 ft. from the edge and connected to the tank through a 0.01 shunt. The result of this test using magnesium anodes was not satisfactory, because the potential readings obtained were below the accepted criterion of —0.85 volt required for complete protection.

Another installation was made in a group of six tanks using a rectifier and graphite anodes with coke-breeze backfill material as the ground bed. The tanks were not insulated from the associate piping.

The rectifier installation consisted of a 50-amp. rectifier and distributed graphite anodes between the tanks. This type of ground-bed installation did not give satisfactory current distribution. Another installation was made with ground-bed anodes distributed on all sides of the tanks. This installation gave even distribution of the current. However, this type of installation proved expensive because of the large number of anode beds required.

Therefore, it was decided to make one installation, and to include all the tankage and underground structure and piping as one complete unit. An outside consulting engineering firm was engaged to make a study of the complete tankage area and the lead-sheath cables to determine the current requirements and make design recommendations for both systems.

Test on Lead-Sheath Power Cables

A test was made in 11 locations of soil resistivity from a depth of 2½ to 22½ ft. The test was made using the four-pin method by which the average resistivity is determined to a depth equal to the spacing between four pins pushed into the surface of the ground. These results showed the soil resistivity to be low and decreasing with depth to a range of 750 to 900 ohms-cm.[3] at 22½ ft. The resistivity of the water from the manholes varied from 1,200 to 2,400 ohms-cm.[3] with a pH of 7.0.

A survey was made in one section of the duct system by measuring at regular intervals the potentials between the cables and a test electrode, and the resistance of the test electrode. An electrode, made of a 12-in. length of power-cable sheath fitted with a pulling eye and having an insulated lead wire, was used for potential and resistance measurements. Resistance of the test electrode (equivalent to the resistance of 1 ft. of cable sheath) is computed from the open-circuit voltage and a current measured by connecting a low-resistance voltmeter as an ammeter between the test electrode and the cables.

A copper sulfate electrode was trailed behind the test electrode, to supplement the cable to test electrode readings. The results of the ducts survey are shown in Fig. 1.

Cable to slug potentials, Fig. 1A, ranged from —165 to +169 mv., and resistance values from 130 to 400 ohms. Therefore, the slug-positive areas would indicate a corrosive condition.

Cathodic-protection test . . . A cathodic protection test simulating the use of a magnesium ribbon anode was carried out with the duct survey using a steel wire pulled through a spare duct and energized with a battery. The test cur-

Author is with Cities Service Refining Corp., Lake Charles, La.

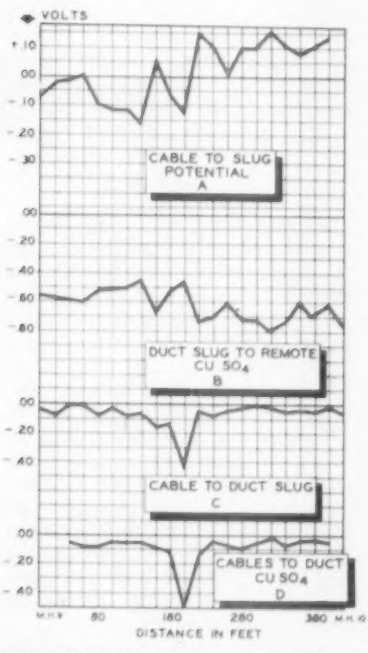
REFINING

rent was adjusted to 1.2 to 1.4 amp. The potential changes due to the impressed current is shown on Fig. 1C and 1D. The cable and duct slug collected current throughout the full length of the duct run. The large potential change at the center of the cable runs was probably caused by the anode wire being in contact with low-resistance steel pipe at the seal-pit location, resulting in an abnormal current distribution.

From the results of the test it was questionable whether or not a magnesium ribbon anode in the duct run would completely control the corrosion condition without periodically flooding the duct system to reduce the alkali concentration. The use of a magnesium ribbon anode would also use up the available duct capacity, which might be needed for future expansion of the electric distribution system.

Consideration was given to the use of 16-lb. magnesium anodes in vertical holes with a suitable backfilled material. They would be spaced 25 to 35 ft. apart and 5 ft. from the duct system connected by a header wire which would be connected to the cables in the manholes. This type of installation would not be economical or practical because of the number of anodes required to supply the current requirements.

The use of graphite anode ground beds placed at a few strategic locations and energized with rectifiers was selected as the most economical and practical for this application. This type of system at first appeared inapplicable because of the shielding effect of the mass of underground structures and piping which are interconnected throughout the refinery grounding system. But since the underground piping was to be protected, this type of system was decided upon, and several temporary ground beds were installed. These were energized with welding generators to determine the total currents required for the entire cable system.



DUCT SURVEY shows potentials made with a test electrode formed from a length of power-cable sheath and with a copper sulfate electrode. Fig. 1.

Test on Tank-Farm Area

The same type of soil-resistivity test was made in the tank farm, as for the cable system, and ranged from 700 to 3,500 ohms-cm.[3] A soil sample taken from one of the tanks, the bottom of which was being replaced because of corrosion leaks, has a resistivity of 650 ohms-cm.[3] This sample was a sandy clay from one of numerous patches of clay scattered throughout the sand pad under the tank. The clay patches may produce anodic areas causing intense continuous corrosive action with high current density in the anodic areas producing deep pits in the metal.

This condition probably accounts for the majority of tank failures encountered to date.

A battery of 18 tanks was isolated from the plant piping and outside plant piping by the installation of insulating flanges with the exception of three main pipelines to the pump station. This was impracticable because the three 12-in. lines are in contact with the main trunk lines through steel supports. A length of approximately 1,000 ft. of an uncoated, buried, abandoned 6-in. pipeline was used as a ground bed.

Current was supplied by a welding generator connected between the abandoned pipe and the 18 tanks. The test current was interrupted periodically by a current interrupter which operated a relay connected with a shunting condenser in the field leads of the exciter.

The effective current on the tank bottom was determined by subtracting the current flow on the uninsulated lines to the pump station from the 200 amp. supplied by the welding machines. The effect of 80 amp. on the tank bottoms produced a voltage change to remote (750 ft. from tanks) and close (5 ft. from tanks) copper sulfate electrodes.

This varied from 20 to 100 mv. at 5 ft. and 56 to 60 mv. to the remote electrode. The throw of test current from a single ground bed, although nonuniform, indicated that cathodic protection could be obtained from a number of distributed ground beds. The protective current may range from 0.8 to 3.0 ma. per sq. ft. and would vary considerably between tanks. It was considered that an average current density of about 2.0 ma. per sq. ft. would be required to polarize the bottoms, and thereafter protection could be maintained at a lower value of current.

From the results of the tests made on the cable sheath and tankage, it was decided to have an outside engineering and contracting firm prepare the detail engineering specification and make the complete installation.

The proposed installation also was checked with the telephone company for possible interconnection of some of the communication lead-sheath cables, and they recommended bonding the communication lead-sheath cables to the system at two locations.

Cable Design and Results

Five oil-immersed rectifiers were installed on the lead-sheath power and control system with the following capacities.

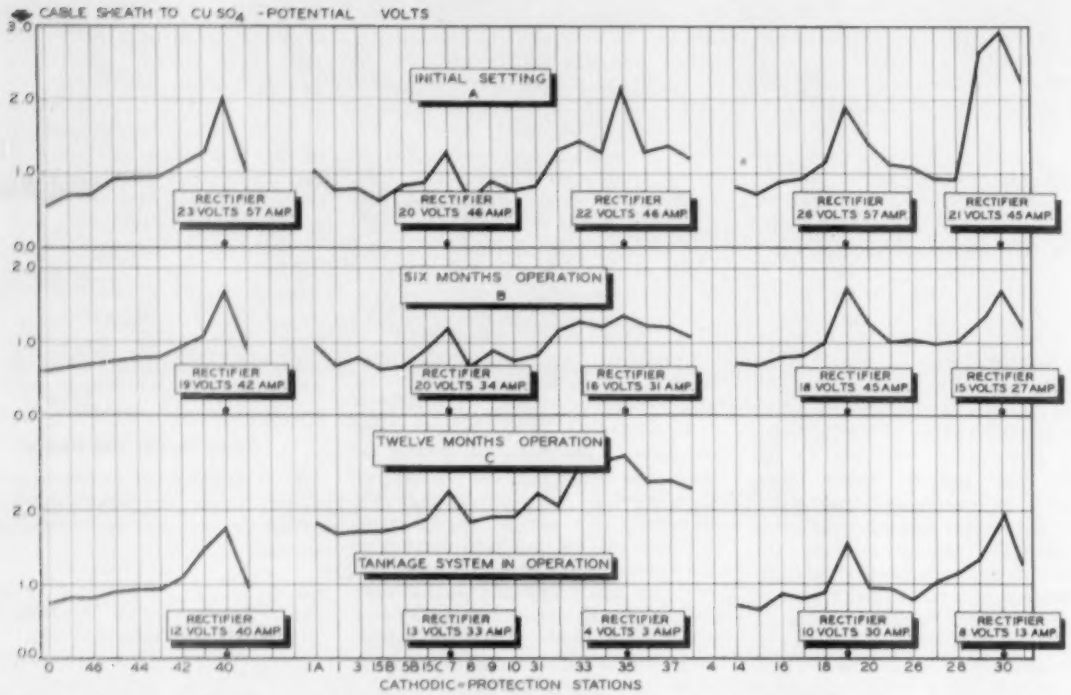
Rectifier	Location—	D.c. rating— Volts	Amp.
1	Water pump station—station No. 40	30	72
2	Water well No. 3—station No. 7	24	60
3	Pump station—station No. 35	24	60
4	Substation 13L—station No. 19	24	60
5	Substation 13—station No. 30	24	60

The size of the rectifiers is larger than the estimated requirements, but the extra capacity was used to protect some of the underground structures and piping indirectly connected to the power-cable sheath. The initial rectifier output setting and potentials obtained on the lead-sheath power cable are shown on Fig. 2A. After the rectifiers had been in operation for 6 months, it was found that the output of several of the rectifiers could be reduced because of polarization of voltage on the cable.

Fig. 2 shows that some of the sections of the cables have impressed voltage in the magnitude —1.0 to 2.0 volts, as measured to a copper sulfate electrode. The experience of several companies over a period of years indicates that a high potential on lead is not harmful. The harm to lead, according to their experience, is caused by frequent interruption of the protective current after polarization.

Interrupting the current flow after the polarization period allows the charge to dissipate somewhat in the manner of lead-storage cell discharge, with a consequent deterioration of the lead. The same action will occur, of course, if a lower potential is maintained, but the action will be at a slower rate.

This impressed voltage on the lead-sheath power cable, after in service for


CABLE SHEATH TO CU SO4 - POTENTIAL VOLTS
3.0
2.0
1.0
0.0
INITIAL SETTING
A
RECTIFIER 23 VOLTS 57 AMP
RECTIFIER 20 VOLTS 46 AMP
RECTIFIER 22 VOLTS 46 AMP
RECTIFIER 26 VOLTS 57 AMP
RECTIFIER 21 VOLTS 45 AMP
SIX MONTHS OPERATION
B
RECTIFIER 19 VOLTS 42 AMP
RECTIFIER 20 VOLTS 34 AMP
RECTIFIER 16 VOLTS 31 AMP
RECTIFIER 18 VOLTS 45 AMP
RECTIFIER 15 VOLTS 27 AMP
TWELVE MONTHS OPERATION
C
TANKAGE SYSTEM IN OPERATION
RECTIFIER 12 VOLTS 40 AMP
RECTIFIER 13 VOLTS 33 AMP
RECTIFIER 4 VOLTS 3 AMP
RECTIFIER 10 VOLTS 30 AMP
RECTIFIER 8 VOLTS 13 AMP
0 46 44 42 40 1A 1 3 15B 5B 15C 7 8 9 10 31 33 35 37 4 14 16 18 20 26 28 30
CATHODIC-PROTECTION STATIONS

PROTECTION OF POWER-CABLE SHEATH is provided by five rectifiers rated at 24 to 30 volts d.c. Impressed voltages are in the range of 1 to 2 volts with respect to reference electrode over most of the system. Fig. 2.

6 and 12 months, is also shown on Figs. 2B and 2C.

A duct slug test also was made on four sections between manholes to determine the distribution of the cathodic protection voltage on the cables. This test indicated that the entire sections between the manhole was slug-negative indicating a protected condition.

Tankage and Piping Design

Twenty-seven oil-immersed rectifiers were installed on the underground piping and tankage systems.

Before the rectifiers were energized, insulating flanges were installed in all of the foreign pipelines extending into the plant, and in the pipeline from the pump station to the docks. Before the rectifiers were energized, the potentials on each side of the insulated flanges were measured, and after final adjustment of the rectifiers, the measurements were repeated. This information revealed that there is no interference with the foreign lines.

The same procedure was used to check the insulation of the dock pipeline flanges so as to avoid electrical hazard on the docks, because of the potential produced by the protective system. Also there was some slight leakage around the insulation. The total current leakage is small, and since all the pipelines on the docks are bonded together, and our standard grounding practices are adhered to in loading operations, this condition is considered to be adequate.

To avoid any electrical hazards at the pump stations, all piping in the pump stations were bonded together to have parallel passages for the current flow, to avoid any electrical hazards for an open-circuit condition. This same condition exists around Dresser couplings. They must be bonded to avoid open circuit during different conditions of expansion and contraction of the coupling.

The total current requirement was approximately 1,720 amp. for rectifiers supplying the tanks and underground piping at the original setting. The same potential and current measurements were made about 12 months after the original setting and show that the potential have a slight increase with a decrease in total current requirements of 1,700 amp. from the rectifiers.

Tank-bottom gradient . . . To obtain some idea of the voltage gradient under the bottoms of the tanks, several tanks have been drilled and the potential measured at the center as shown in Appendix A. From this data —1.0 to —1.2 volts is maintained on the rim of the tank to insure a protective voltage of —0.85 at the center.

The shift from the normal to protected in some of the congested unit areas was not as great as that in the tank farms and a potential measurement to remote electrode located 4,700 ft. from the plant was made at 200-ft. intervals.

At this distance the potential of the plant to the remote electrode was —1.21 volts; the resulting curve was rising showing that higher potentials should exist with further distance.

Standard practice is to consider a plant network in satisfactory cathodic protection, if the potential to remote is —1.20 volts at a distance of five times as great as the widest dimension.

Construction Details

The construction was contracted to subcontractors by the consulting engineering firm and all work was installed according to plans and specification under the supervision of the consulting engineer and the company contract engineering section.

The anode ground beds were constructed of 3 by 60-in. graphite anodes, as shown on Fig. 3 typical anodes installation. Single-conduction 3/0 aluminum and copper wire with a rubber insulation and neoprene jacket for direct burial was used for all connections between tanks, rectifiers, and ground beds. The aluminum wire was used primarily because of the shortage at that time of copper wire.

Particular care was taken in making each joint to insure a watertight connection. Collector cable splices on Fig.

(Continued on page 145)

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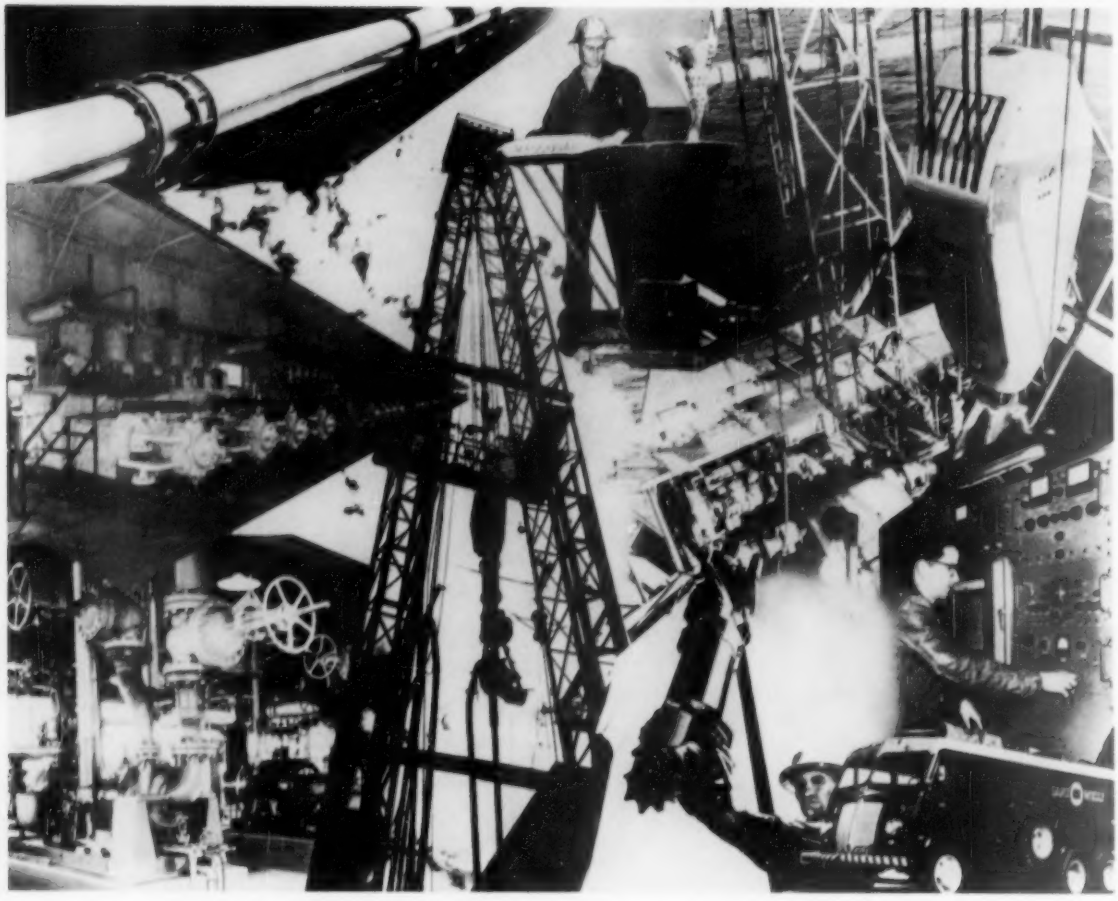

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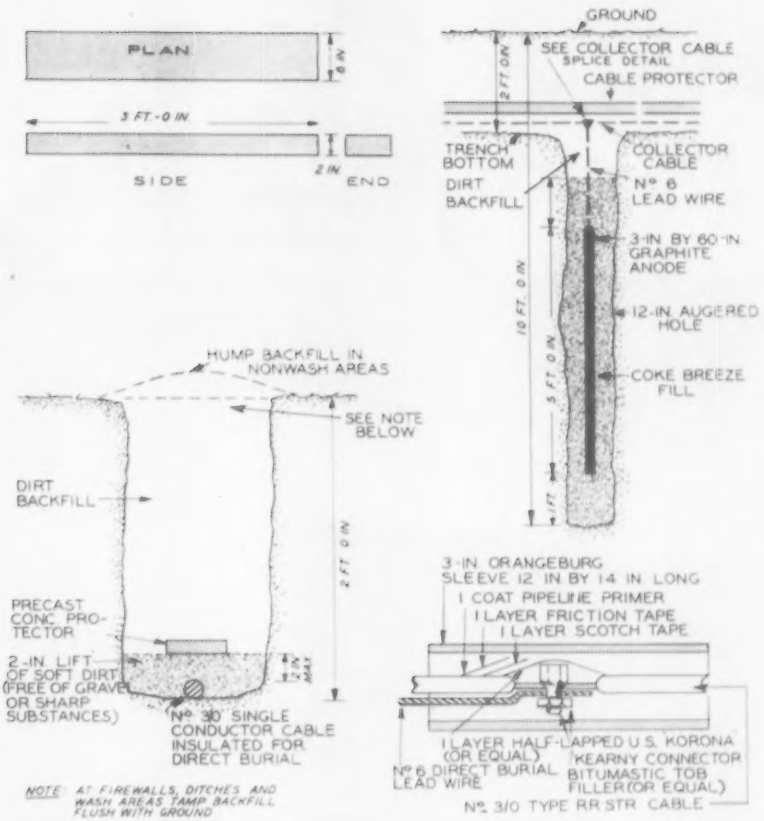

PLAN
6 IN
3 FT-0 IN
SIDE
2 IN
END
GROUND
SEE COLLECTOR CABLE SPLICE DETAIL
CABLE PROTECTOR
2 FT 0 IN
TRENCH BOTTOM
DIRT BACKFILL
COLLECTOR CABLE
Nº 6 LEAD WIRE
3-IN BY 60-IN GRAPHITE ANODE
10 FT 0 IN
12-IN AUGERED HOLE
3 FT 0 IN
COKE BREEZE FILL
3 FT
HUMP BACKFILL IN NONWASH AREAS
SEE NOTE BELOW
DIRT BACKFILL
2 FT 0 IN
PRECAST CONC. PROTECTOR
2-IN. LIFT OF SOFT DIRT (FREE OF GRAVEL OR SHARP SUBSTANCES)
2 IN MAX
Nº 3/0 SINGLE CONDUCTOR CABLE INSULATED FOR DIRECT BURIAL
NOTE: AT FIREWALLS, DITCHES AND WASH AREAS TAMP BACKFILL FLUSH WITH GROUND
3-IN ORANGEBURG SLEEVE 12 IN BY 14 IN LONG
1 COAT PIPELINE PRIMER
1 LAYER FRICTION TAPE
1 LAYER SCOTCH TAPE
1 LAYER HALF-LAPPED U.S. KORONA (OR EQUAL)
Nº 6 DIRECT BURIAL LEAD WIRE
KEARNY CONNECTOR
BITUMASTIC TOB FILLER (OR EQUAL)
Nº 3/0 TYPE RR STR CABLE

ANODE INSTALLATION consists of buried 3 by 60-in. graphite anode connected to a single-wire collector cable 2 ft. below the surface. Fig. 3.

3 shows the details of these connections. All cables aboveground were installed in rigid metal conduit to afford mechanical protection, and the underground single conductor d.c. supply and return conductors were protected by a precast concrete slab as shown in Fig. 3.

Numerous minor and some major field changes during construction were required to avoid conflicting with existing structures and operating requirements. One major change was the use of mechanical clamps on the manifolds at some of the pump stations, because of safety consideration during construction. The original connection to the manifolds was to be made by welding to the pipe a steel coupon to which was brazed a split bolt connector.

Considerable trouble was experienced with the failure of insulation joints in the pipelines to the dock area; some because of improper installation and some because of operations which necessitated unmaking and remaking joint.

The specification for the rectifiers used on this installation is shown on Appendix B.

Appendix A

Tank No.	Tank diam. (ft.)	Avg. volts tank rim	Volt center	Volt drop	
54	117	1.18	1.2	Rise 0.02	New tank — asphalt bottom— no product in tank
92	114	1.23	1.05	0.17	Old tank, sand bottom
51	117	1.19	0.95	0.24	Old tank, sand bottom
95		0.98	0.70	0.284	Old tank, sand bottom
40	120	1.53	1.00	0.53	Old tank, sand bottom
209	48	1.80	0.76	0.32	Old tank, sand bottom
133	75	1.35	1.20	0.15	Old tank under repairs
184	54	1.71	1.03	0.68	New bottom sand foundation
11	117	2.15	2.10	0.05	Old tank, sand bottom
190	48	1.66	1.5	0.16	Old tank
192	48	0.92	0.78	0.14	Old tank
193	50	0.80	0.65	0.15	Sand bottom
194	48	1.25	1.05	0.20	Sand bottom
194	50	1.20	0.94	0.26	Sand bottom
197	50	1.27	0.90	0.37	
215	48	1.08	0.90	0.10	

The effectiveness of any cathodic protection system is based on maintaining a continuity of electric current of the correct magnitude on the protected surface at all times. To maintain this condition our chief electrical inspector is periodically making a check on the operating conditions of the rectifiers, and at least once a year makes a complete potential survey of both the lead-sheath power cables, tank bottoms, and underground piping.

Appendix B

Rectifier specifications . . . Rectifiers shall be selenium type, oil immersed, rated for 50° C. ambient temperature, fabricated as follows:

Case . . . Case to be of No. 11 gage steel, all-welded construction, designed for platform mounting. Baked-enamel finish shall be suitable for outdoor service. In addition to entrance fittings for meters and switches (see below) case shall be provided with one ¾ and one 2-in. conduit nipple welded into the case for entry of a.c. and d.c. leads, respectively. Both nipples shall be provided with conduit bushing on interior end and positioned to allow free turning radius for proper size Type EYS explosionproof seal fitting (not to be supplied).

A.c. operation and fittings . . . Rectifiers shall be designed for operation on 220/440 volt, single-phase or three-phase, as specified, 60-cycle a.c. and shall be provided with a circuit breaker of proper rating in an explosionproof housing.* Transformer secondary taps, located below operating oil level, shall be provided as necessary to permit ready adjustment of d.c. output voltage from zero to maximum in a minimum of 18 steps, with a maximum voltage change per step of 3 volts, approximately.

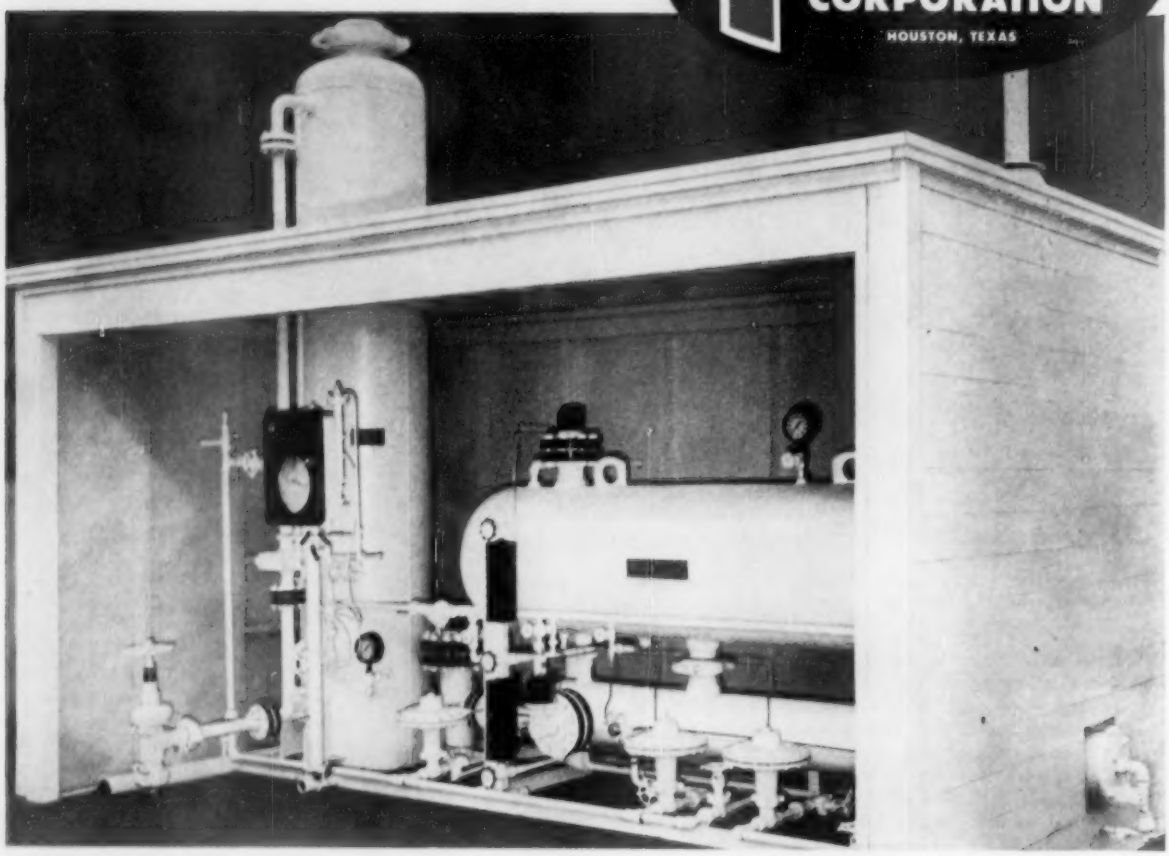
D.c. operation and fittings . . . Rectifiers shall be designed for d.c. ratings as specified. D.c. output studs shall be provided with compression-type lugs to accommodate No. 3/0 maximum stranded copper cable. D.c. output voltmeter and ammeter with easy-to-read scales and scale divisions in even multiples of the measured quantities shall be provided. Where external ammeter shunt is used, shunt calibration shall be plainly marked on the face of the ammeter. D.c. meters shall be provided with disconnect switches, and switches and meters shall be mounted in explosionproof housings.

Note: Rectifiers to be furnished less oil.

*Single-phase units shall be supplied with two-pole breaker; three-phase units shall be supplied with three-pole breaker.

a revolutionary new development by ——

fish
ENGINEERING CORPORATION
HOUSTON, TEXAS



the new FISH well head gas dehydration unit

Here is a revolutionary new gas dehydration unit that greatly reduces overall dehydration costs. The new Fish Unit uses calcium chloride as the dehydration agent in a tower of patented design that removes from two to three times as much water per unit of desiccant as former methods. No fuel is needed for the dehydration tower. No maintenance is required aside from reloading desiccant and changing charts.

The Fish Dehydration Unit is packaged to include a separator, a heater to keep water in the separator above freezing and necessary controls and instruments. The entire unit is enclosed in a winterized structure.

Extensive field tests have proved the efficiency of the Fish Dehydration Unit even in severe winter climates. For full information, write Fish Engineering Corporation, Manufacturing Division, Aztec, New Mexico.

AFFILIATED COMPANIES: FISH ENGINEERING CORPORATION, HOUSTON, TEXAS
FISH SERVICE & MANAGEMENT CORP.; FISH NORTHWEST CONSTRUCTORS, INC.

by W. L. Nelson
Technical Editor

COST-imating

19. Prices of Pipe, Tubing, and Bends

COST INDEXES (1946 = 100)

	Boiler tubes	Type 304 stainless*	Copper ingot	Nickel cathod	Black pipe	Nelson index†
1946	100	100	100	100	100	100.0
1947	115	108	151	111	120	117.0
1948	132	112	158	116	141	132.5
1949	141		137	127	152	139.7
1950	150		153	143	160	146.2
1951	163		174	171	169	157.2
1952	169	168	174	161	179	163.6
1953	188	179	206	171	186	173.5
1954	199	183	212	163	194	179.8
1955	211	193	240	173	204	184.2

***Relative to 24 cents per pound (1946) for Type 304 bars. Also applies to Type 403 slab at 18 cents per pound (1946). †The Oil and Gas Journal, July 7, 1952, p. 105. The Index also appears in the first issue each month and in addition, indexes of many items of equipment are published in the first issue of the months of January, April, July, and October.**

TABLE 1 — APPROXIMATE COST OF WELDED AND SEAMLESS PIPE†

(Dollar per foot—1946 and 1956*)

Pipe size, in.	Standard (Sch. 40 and 30)		Extra heavy (Sch. 80 and 60)		Double extra heavy, seamless
	Welded	Seamless	Welded	Seamless	
½	.04(.09)		.06(.12)		
1	.08(.17)		.10(.22)		
1½	.12(.27)		.17(.37)		
2	.16(.36)	.20(.44)	.23(.50)	.30(.65)	.59(1.30)
3	.34(.74)	.39(.84)	.47(1.02)	.56(1.23)	1.15(2.53)
4	.53(1.17)	.52(1.14)	.73(1.60)	.77(1.69)	1.68(3.70)
6	1.05(2.20)	.90(1.97)	1.35(2.95)	1.44(3.15)	3.27(7.18)
8		1.20(2.62)		2.10(4.59)	4.45(9.78)
10		1.56(3.41)		2.64(5.79)	
12		2.16(4.73)		3.20(7.00)	
14		‡2.22		‡3.53	
16		‡2.52		‡4.06	
18		‡2.84		‡4.58	
20		‡3.14		‡5.10	
24		‡3.78		‡6.15	

*February 1956 prices in parentheses (Tulsa). ‡Out-of-stock prices. Carload lots are 20 per cent less. Other pipe materials cost per foot relative to steel are about:

No. 304 stainless	18 (large 14)
No. 316 stainless	25 (large 20)
No. 347 stainless	22 (large 16)
Galvanized	1.2 (very small 1.6)
Copper	3.0
Brass	5-7
Monel	21.0
Nickel	35.0 (large or small 25)
Glass	5-8
Polyethylene	2.3

‡Computed on a basis price 1946 of 4 cents per pound for standard and 4.9 cents per pound for extra heavy.

TABLE 2—APPROXIMATE COST OF SEAMLESS TUBING*

(Dollar per foot—1946 and 1956†)

Tubing size, o.d. in.	Gage, B.W.G.	Steel	Stainless (304)	4-6 Chrome	Admiralty or brass
⅝	14	.08(.16)	.47(.94)	.24(.47)	.17(.41)
	16	.07(.16)	.42(.85)	.23(.47)	.14(.34)
	18	.06(.14)	.38(.75)	.20(.41)	.12(.30)
	20	.05	.31	.16	.09
¾	14	.08(.18)	.53(1.05)	.25(.49)	.20(.49)
	16	.08(.17)	.47(.94)	.24(.48)	.17(.41)
	18	.07(.15)	.41(.83)	.21(.43)	.13(.32)
1	12				
	14	.11(.24)	.81(1.62)	.29(.58)	
	16	.09(.20)	.64(1.27)	.27(.54)	.27(.66)
	18	.09(.19)	.57(1.13)	.26(.53)	.22(.54)
		.08(.17)	.49(.98)	.24(.48)	.17(.42)
1¼	10	.13(.28)	1.13(2.27)	.36(.73)	
	12	.11(.25)	.97(1.94)	.34(.69)	
	14	.11(.24)	.77(1.54)	.32(.65)	.34(.83)
	16	.10(.23)	.69(1.38)	.31(.62)	.28(.69)
	18	.09(.19)	.62(1.23)	.28(.56)	.23(.57)
1½	10	.15(.33)	1.30(2.59)	.42(.84)	
	12	.13(.29)	1.12(2.24)	.38(.76)	
	14	.12(.26)	.90(1.81)	.33(.67)	
	16	.12(.25)	.82(1.64)	.33(.66)	
	18	.10(.22)	.74(1.48)	.32(.63)	

*Carload lots. Referred to steel, monel tubes cost about 8 times and nickel about 10 times. Referred to admiralty, copper costs only 50-70 per cent, cupro-nickel 1.3-1.5, and aluminum 30-40 per cent. †February 1956 prices f.o.b. Tulsa in parentheses.

TABLE 3 — APPROXIMATE COST OF CARBON-STEEL RETURN BENDS*†

(Dollars each 1946, in lots of 50-100)

O.d. of tube, in	Bends		Elbows	
	Light and box type	Heavy or elaborate‡	Light	Heavy‡
1½	22	30	18	23
2	24	34	19	25
2½	26	38	19	27
3	28	44	20	30
3½	30	49	21	33
4	34	55	23	37
4½	39	64	25	41
5	49	76	30	46
5½	62	93	36	54
6	78	112	43	65
6½	92	135	50	77

*Seamless tubing costs 5-6 cents per pound 1946; machining of tube ends if necessary $2.10-3.00 each; and high-temperature bolts $100-$140 per 100.

†Cost of other materials relative to carbon are about: for tubes 0.5 Moly 1.3-1.5; 0.5 Moly, 1¼ Cr., ¾ Si., 1.8-2.0; 0.5 Moly 5 Cr., 3.3-3.6; and 18-8 Cr-Ni, 10-12. Bends cost much the same except that the cost of special materials may be only 50-70 per cent of the factors shown for tubes.

‡Conventional conditions, not extreme pressure.

PART 1

EQUIPMENT DESIGN AND OPERATION

SPHERICAL PROCESS VESSELS

Spherical Vessels Have Many Advantages

by Dave Vondy

ALTHOUGH spherical vessels have been used for many years in various services such as separation and storage, only recently has much attention been given to wide application. In many process applications a spherical vessel can be installed at a lower over-all cost than a more conventional vertical or horizontal vessel.

In some cases, for the same cost a more effective vessel can be installed.

Application . . . Typical applications of spheres include lease gas-oil separators, liquid-liquid and multiphase separators, pressure storage tanks, compressor scrubbers, mist extractor vessels, gas purifiers, mixing chambers, contactors, reactor vessels, surge vessels, liquid pumping units, pressure-loaded accumulator tanks, and special heat exchangers. It can be shown that in most processing plants and production systems one or several spherical vessels can be used to definite advantage.

Fabrication . . . Small hemispherical heads are pressed in one piece while larger sizes must be made in segments. Seams are readily welded automatically when adequate jig setup equipment is employed. Radiographing is relatively simple because a single setting of an isotope will permit an entire circle seam to be photographed.

Main advantages . . . The primary advantage of a spherical pressure vessel over a cylindrical vessel is its lower steel content for the same volume. For a spherical vessel, if it is assumed that the quantity of steel is equal to the thickness times the surface area and that the required shell thickness is equal to a constant, C, times the radius, the quantity of steel in the vessel is equal to 3C (volume).

For a cylindrical vessel, neglecting the weight of the heads and their volume, assuming that the quantity of steel is equal to the thickness times the surface area of the cylinder, and using the corresponding equation for the shell thickness equal to C times the diameter, where C is the same constant used above, the quantity of steel is equal to 4C (volume).

From this simplified analysis it is concluded that the spherical vessel requires approximately one-fourth less steel and is one-fourth lighter.

Likely the second most important advantage of this design is the ease with which the vessel can be handled. In the event that hoisting facilities are not available, this vessel can be moved over a short distance and set up with fewer men than either vertical or horizontal vessels which is especially significant in the case of small high-pressure vessels.

A horizontal vessel is difficult to move and any cylindrical vessel is hard to erect from a lying-down position. Lighter weight means less expensive handling costs.

The spherical vessel in the smaller sizes is like the horizontal in that it is entirely accessible without a ladder. This is a decided advantage over many vertical vessels.

Advantages in gas-liquid separation . . . In lease separating service, the double-barrel horizontal vessel is widely used because it has a high gas capacity compared to single-barrel or vertical vessels. The primany disadvantages of this two-cylinder design hinge around the isolated liquid chamber.

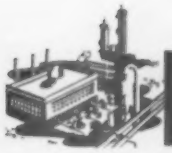
During cold weather, hydrate trouble is often experienced because this lower chamber operates much colder than the upper chamber. In some cases the solution is to operate the separator at an excessive temperature if a flow-line heater is used, and with greater separation temperature, decreased liquid recovery results.

Many installations can be seen where the bottom chamber has been insulated or is heated externally. Also, the liquid-level gage on a horizontal vessel is often not only a source of trouble but in some cases of no value. In one plant the liquid-level gages were removed from several vessels because they caused so much operator confusion that the level controllers were needlessly adjusted and readjusted.

When the vessel handles oil or condensate plus a heavier liquid (water or glycol) the level gage seldom indicates a true liquid level. Since the level gage is connected to the bottom of the vessel, it more often than not is plugged with mud and sand.

Also the liquid-level controller does not function properly in many instances when the bottom chamber is made very small as is necessary in some high-pressure vessels.

Author is with Constructive Engineering, Baton Rouge, La.



JOB IMPROVEMENT FOR THE PROCESS FOREMAN—66

Depropanizer Separates Propanes and Butanes

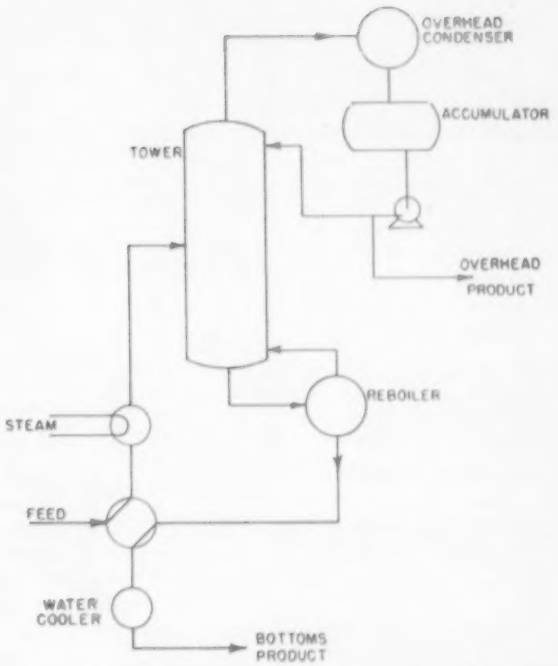
THE function of a depropanizer is to provide a sharp separation between propanes and butanes. The overhead product stream is mainly propane and propylene and contains as little butanes as possible. The bottoms product is largely isobutane, butylene, and normal butane which are charged to the alkylation unit and should not be contaminated with propane. The composition of the bottoms product should be carefully controlled for minimum propane content because the presence of propane has an adverse effect on the production of alkylate.

Debutanization . . . The charge to a debutanizer usually consists of propanes, butanes, and gasoline. The tower should be operated to recover all the propane and butane in the overhead product with a minimum carry over of gasoline.

Most debutanizing operations, however, do not completely remove butanes from gasolines because excessive gasoline content of the butane stream cannot be tolerated.

Gasoline return . . . Refinery gasoline-blending techniques require gasoline streams with different boiling ranges. Since most raw-gasoline streams have a boiling range of about 100° F. end point, rerun towers must be provided to produce a light, high octane overhead product for special gasoline and a heavy lower octane bottoms product for regular gasoline.

The separations required on these towers are of necessity quite varied. Some towers are operated to produce an end-point specification on the overhead product. Other towers are operated for maximum overhead product, and so forth. The most important objective in operating rerun towers is to minimize contamination of the overhead product with bottoms (and vice versa) by using good fractionating techniques.



FLOW DIAGRAM of a reboiler type of tower. Fig. 9.

A generalized flow diagram of a reboiler type of tower is shown in Fig. 9. The feed to the tower first passes through a shell-and-tube heat exchanger where it is preheated by the hot bottoms product. This stage of the preheat is especially important because the heat picked up by the feed would otherwise be wasted in heating water in the product cooler.

The heat conserved by use of a bottom-feed exchanger results in substantial savings in the use of steam in the steam preheater. The quantity of steam to the preheater is controlled to maintain the correct feed temperature to the tower. Usually sufficient heat is supplied in the preheater to vaporize a portion of the feed to the tower.

The preheated feed is flashed into the tower where it is contacted with vapor rising from the bottom section of the tower. This vapor which is generated in the reboiler strips out the lighter components in the liquid on each tray. The composition of the vapor, therefore, becomes progressively lighter as it approaches the top of the tower.

Only the lighter hydrocarbons in the feed remain in the vapor leaving the top tray of the tower. Most or all of this vapor is liquefied in the overhead condensers. The condensate falls into a small storage drum or accumulator. A portion of the condensate is pumped back to the top tray of the tower as reflux. The balance of the condensate is pumped away as overhead product to storage or to another tower. Usually a small quantity of gas is bled off the overhead accumulator through a back-pressure regulating valve to control tower operating pressure.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.

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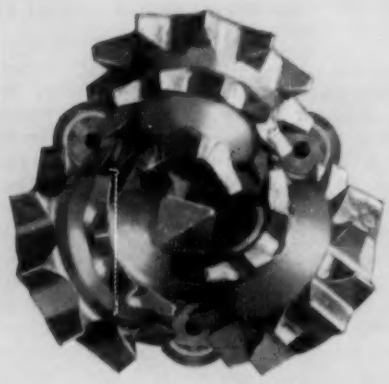

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Signal Cuts Drilling Time in Canada

In the 4½ months since Signal Exploration, Inc., of Tulsa, and Casper, Wyo., moved its three 8,000-ft. rigs from the U. S. Rocky Mountain district to the Steelman area, in southeastern Saskatchewan Province, Canada, it has drilled 21 4,800-ft. wells, or about 100,800 ft. of hole. This is an average of about 33,600 ft. of hole per rig.

With this experience behind its field organization, it has reduced its individual well time, including rigging up and tearing down, to about 15 days. Its rigs are Unit Rig & Equipment Co. assemblies, including two of the U-36-A type and one U-15.

In line with its policy of presenting its rig-operating personnel with merit awards for outstanding achievement, the company, since its move to the Steelman area, has made two such awards, one for a 1,390-ft. tour, and the other for a 1,500-ft. tour. Both these footage achievements were made in drilling just below surface casing.

Field office for these operations is at Estevan under the direction of W. M. Barnhart, assistant drilling superintendent.

Boilers and other special rig-winterizing equipment are being moved into the area in preparation for the long Canadian winter period.

Hurley & Beene, Inc., of Shreveport, is drilling a 5,800-ft. Wilcox test at a wildcat location nearly 3 miles southwest of Wildsville field, in Catahoula Parish, East-Central Louisiana. It is a contract job for Mobley & Stevens, also of Shreveport, at 1 Oliver Brown, in 15-7n-6e.

Clark Fuel Producing Co., Mission, Tex., has taken a 3,500-ft. job in Willacy County, in the lower coastal area of Texas. It is a wildcat test for Renwar Oil Corp., of Corpus Christi. Location is listed as 1 Elmer Johnson, in the Hebmer Subdivision, 2 miles southeast of San Perlita.

A. B. See Drilling Co., Inc., Abilene, Tex., is drilling Ohio Oil Co.'s first well

OPERATING in Steelman area, southeastern Saskatchewan Province. Rig No. 3 of Signal Exploration, Inc., under contract to Sun Oil Co. It is powered by four Caterpillar Diesel D337 engines, two compounded to drive the draw works, and two to the mud pumps. A D311 Diesel-electric set provides auxiliary power.

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in the new Thornton field, 10 miles southwest of Abilene, in Taylor County, West Central Texas. The test is Ohio's 1 Parmelly. Contract is for 4,500 ft. The contractor is using its National T-20 rig.

Penrod Drilling Co., Shreveport, has scheduled two additional South Louisiana operations. One is a 7,000-ft. test for William P. Irwin, of New Orleans, at 1 Washington-Opelousas, on the west flank of the old Jennings dome, in Acadia Parish. The other is a 9,800-ft. job for Caroline Hunt Sands at 1 Rangley, a wildcat in 8-5s-6w, 2½ miles east of Dry Creek field, in Beauregard Parish.

Ray Coleman is contractor on a 4,200-ft. Camerina test Texkan Oil Co. is undertaking on the southeast flank of West Hackberry salt dome in Cameron Parish, southwestern Louisiana. The operation marks Texkan's debut to South Louisiana. Name of the test is 1 Brenchley. Location is in 28-12s-10w.

Noble Drilling Co., Tulsa, will put down a 9,000-ft. test for Samedan Oil Corp. at a wildcat location about a mile southeast of East Moss Lake field, Calcasieu Parish, southwestern Louisiana. Spot location is in 10-11s-9w.

Sunnyland Contracting Co., Rayne, La., has contracted for a 10,500-ft. test for Serio-Punches Oil Co., of Natchez, Miss., at a wildcat location 3 miles south of nearest production in Clear Creek field, on the Allen-Beauregard parish line. Location is on the Allen Parish side at 1 Bel, in 29-6s-7w.

Larco Drilling Co., Jackson, Miss., will drill a Lower Cretaceous-Rodessa test for Plymouth Oil Co. in eastern Greene County, southeastern Mississippi. Location is about 2½ miles northwest of Leakesville. It is on Plymouth's Turner lease, in 32-3n-6w, which is 20 to 25 miles northwest of Citronelle field, in Mobile County, Alabama, where sizable Lower Cretaceous production is being developed. Plans call for a 12,800-ft. test.

Survey Drilling Co., Dallas, has a new contract job scheduled for Escambia County, southern Alabama. It is a 7,000-ft. Lower Cretaceous test for T. E. McMillan, of Brewton, Ala., and A. R. Temple, of Biloxi, Miss. Location is inside the corporate limits of Pollard, about 2 miles southeast of Pollard field, where production is from the Tuscaloosa (Upper Cretaceous) horizon. It is listed as 1 Pringle and others with spot in 21-1n-9e. This is 3 miles north of the Florida line.

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RIVER CROSSINGS
PRODUCTS PIPELINES
GAS PIPELINE CONSTRUCTION

R. H. FULTON & CO.

CONTRACTORS LUBBOCK, TEXAS

Pipeline Patrol

. . . Report on Construction

Under Way, Contracted, and Planned

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way. Uncontracted projects are indicated by • preceding the project.

Crude-Oil Pipelines

Buckeye Pipe Line Co.
Project: Reconditioning 191 miles of 8-in from Griffity, Ind., to Lima, Ohio.
Status: Under way.
Completion: November 1956.

Fulton, R. H. & Co., Lubbock, Tex.
Project: 20 miles of 6-in. from Donkey Creek field near Moorcroft, Wyo., to Butte Pipe Line Co.'s line.
Status: Has applied to Wyoming Public Service Commission. Application competes with that of Powder River Pipeline Co.

• **Magnolia Pipeline Co.**
Project: 36 miles of 12-in. from Andrews to Midland, Tex.
Status: Planned.
Completion: January 1, 1957.

Northwest Pipeline Corp. (an affiliate of Pacific Northwest Pipeline Corp.)
Project: 350 miles of 8-in. crude and products line from Four Corners area to Salt Lake City.
Completion: August 1957.

• **Offshore Gathering Corp.,** Houston.
Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana.
Status: Proposed.

• **Pasotex Pipe Line Co.**
Project: 127 miles of 20-in. along its route from Wink to El Paso, retiring another dual 8-in. section.
Status: Planned.
Completion: July 31, 1957.

• **Powder River Pipeline Co.,** Fratt Building, Billings, Mont.
Project: 20 miles of 6-in. from Donkey Creek field near Moorcroft, Wyo., to Butte Pipe Line Co.'s line. (See Fulton, R. H. & Co., above.)
Status: Planned.

• **Shannon Oil Co.,** Denver.
Project: 34 miles of 6-in. from Murphy dome in Hot Springs County, Wyoming, to contact Ohio Oil Co.'s line in Big Horn County. Joint project with Farmers Union Central Exchange, Inc., and Mule Creek Oil Co., both of Billings, Mont.
Status: Under way.
Completion: December 1, 1956.

Shell Pipe Line Corp.
Project: 42 miles of 20-in. from Shell's Houston refinery to Brookshire Station.
Status: Under way.
Contractor: **Bill Murry & Co.;** Bill Murry spread superintendent, office 12629 South Main Street, Houston.
Completion: December 1, 1956.

• **Sinclair Pipeline Co.**
Project: 150 miles of 20-in. from Teague, Tex., to Houston.
Status: Planned.

• **Tecumseh Pipe Line System**
Project: 19 miles of 20-in. between East Chicago and Cygnet, Ohio. Joint project with Sinclair Refining Co., Pure Oil Co., Ashland Oil & Refining Co.
Status: Planned.
Completion: September 1957.

• **Union Oil Co. of California.**
Project: 225 miles of 16-in. from San Joaquin Valley to its refinery at Oleum, Calif.
Satus: Planned.
Completion: Late 1957.

Products Pipelines

• **American Pipe Line Co.**
Project: Line from Gulf Coast to New York City area. Received ODM approval to amortize 40 per cent of $175,000,000 cost with a rapid writeoff.
Status: Planned.

• **Cities Service Oil Co. & Subsidiaries**
Project: 10-mile, 6-in. L.P.G. line from Maysville to near Pauls Valley, Okla., to tie in to Shell line moving on to Cushing, Okla.
Status: Planned.

• **El Paso Natural Gas Co.**
Project: 240 miles of "larger than 6-in." to carry natural gasoline, butane, and propane from its Midkiff natural-gasoline plant in Permian basin, Midland County, Texas, to El Paso.
Status: Planned.
Project: 38 miles of 4-in. from Wingate, N. M., to Prewitt refinery.
Status: Under way.

• **Gulf Refining Co.**
Project: 45 miles of 8-in. from Pontiac Eastern Corp.'s planned refinery at Hattiesburg, Miss., (due on stream May 1957) to a connection with Plantation Pipe Line Co.'s system.

• **Magnolia Pipe Line Co.**
Project: 30 miles of 8-in. from Andrews to Dollarhide, Tex.
Status: Planned.
Completion: January 1, 1957.
Project: 19 miles of 6-in. and 3 miles of 4-in. L.P.G. line from Hull to Texas City, Tex.
Status: Planned.
Completion: January 1, 1957.

Northwest Pipeline Corp. (an affiliate of Pacific Northwest Pipeline Corp.)
Project: 350 miles of 8-in. products and crude line from Four Corners area to Salt Lake City.
Completion: August 1957.

• **Phillips Petroleum Co.**
Project: 15 miles of 6-in. L.P.G. line in Sweeny, Tex., area.

• **Phillips Pipe Line Co.**
Project: 135 miles of 12-in. looping between Borger, Tex., and St. Louis.
Completion: December 31, 1956.

Plantation Pipe Line Co.
Project: 327 miles of 18-in. from Baton Rouge, La., to Helena, Ala.
Status: Under way.
Contractor: **Oklahoma Pipe Line Constructors;** N. L. Arie, spread man, office at Baton Rouge.

• **Shell Oil Co., Pipe Line Department, Pacific Coast.**
Project: Converting 13 miles of existing 4-in. gasoline line and adding 3 miles of new line to move gasoline from Wilmington, Calif., refinery to Los Angeles.
Status: Planned.
Completion: January 1, 1957.

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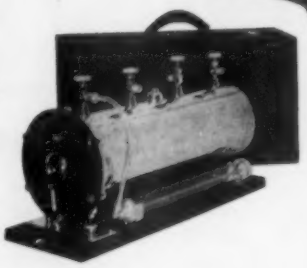

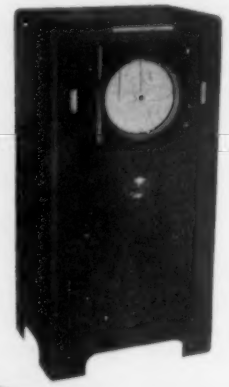

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• **Sioux Oil Co.**
Project: 80 miles of 4-in. from its Newcastle, Wyo., refinery to Rapid City, S. D.
Status: Planned.
Completion: Late 1956.

• **Sohio Petroleum Co.**
Project: 37 miles of 8-in. from Mogadore to Girard, Ohio.
Status: Planned.
Completion: November 1, 1956.

• **Southern Pacific Pipe Lines, Inc.**
Project: 300-mile line to span the Sierras and connect San Francisco with Reno and Fallon, Nev., and to serve the Sacramento Valley.
Status: Planned.

• **Union Oil Co. of California**
Project: 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.
Status: Proposed.

Non-Petroleum Pipelines

• **American Gilsonite Co.**
Project: 70 miles of 6-in. from Bonanza, Utah, to Grand Junction, Colo., to carry slurry of gilsonite from mines to refinery now being built.
Status: Planned.

Natural-Gas Pipelines

American Louisiana Pipe Line Co.
Project: 121 miles of 22-in. from near Defiance, Ohio, to Bridgman, Mich.
Status: Under way.
Contractors: **Houston Contracting Co.** and **H. C. Price Co.** jointly. Houston is laying 75 miles on east end, E. C. Norris, spread superintendent, office at Bryan, Ohio. Price Co. is laying 46 miles on west end, W. H. Olrich, spread superintendent, office at Niles.

• **Arkansas Louisiana Gas Co.**
Project: Line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system.
Status: Long-range plans.

Atlantic Seabord Corp.
Project: 50 miles of 24-in. from Hardy County, West Virginia, to Greene County, Virginia, and 32 miles of 26-in. loops along the Cobb-Rockville line in West Virginia.
Status: Under way.
Contractor: **Williams - Austin Co.**; O. L. Martin, spread man on the 50-mile, 24-in. section, office at Elkton, Va.; Ralph Gaddy, spread man on the 32-mile, 26-in. looping office at Elkins, W. Va.
Completion: November 1, 1956.

• **Carolina Pipeline Co.**
Project: Distribution lines to serve 14 cities in Central South Carolina. Will buy gas from Transcontinental Gas Pipeline Co. or Southern Natural Gas Co.
Status: Has received South Carolina Public Service Commission permit.

• **Coastal Transmission Corp.**
Project: 565 miles of 22-26-in. from McAllen, Tex., to Baton Rouge, to deliver to Houston Texas Gas & Oil Co.'s proposed line to Florida. Also 272 miles of smaller gathering lines.
Status: Seeks FPC permit.

• **Colonial Natural Gas Corp.**
Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.
Status: Proposed.

• **Colorado Interstate Gas Co.**
Project: 238 miles of 22-in. from Laramie to Green River, Wyo. (last part of a 374-mile line between Denver and Rock Springs).
Status: Under way.
Contractor: **R. H. Fulton.**
Completion: Fall 1956.
Project: 1957 program: 307 miles of 30-in. from Idalia, Colo., to Beatrice, Neb., to take gas from a planned 165-mile, 26-in. line from near Carr, Colo., to Idalia, and from a 72-mile, 26-in. line from near Kit Carson, Colo., to Idalia; 215 miles of 20 and 24-in. to parallel present line from Texas Panhandle area to Kit Carson; 34 miles of 16-in. from Keyes field, Oklahoma, and Greenwood field, Kansas, to the new north-south line.
Status: Filed March 29, 1956, for FPC permit.
Project: 24 miles of 16-in. loop between its Morton County, Kansas, station and Four-way-Kit Carson mainline.
Status: Has temporary FPC permit.

El Paso Natural Gas Co.
Project: 193 miles of 34-in. between San Juan basin and Topock, Ariz., and 38 miles of 20-in. between San Juan mainline and Phoenix.
Status: Under way.
Contractor: Doing own construction.
Completion: February 1, 1957.
Project: 146 miles of 34-in. between San Juan basin and Topock.
Contractor: **Western Pipeline, Inc.**
Completion: February 1, 1957.
Project: 112 miles of 20-in. between San Juan mainline and Phoenix.
Status: Under way.
Contractor: **Western Pipeline, Inc.**
Completion: November 1, 1956.
Project: 888 miles of field and main lines in Texas, New Mexico, and Arizona.
Status: Filed June 1956 for FPC permit.
Project: 28 miles of 10-in. in Nolan and Coke counties, Texas.
Satus: Has FPC permit.

• **Hope Natural Gas Co.**
Project: 22 miles of 8-in. in Logan County, West Virginia, and 20 miles of 3 to 8-in. in various West Virginia counties.
Completion: Late 1956.

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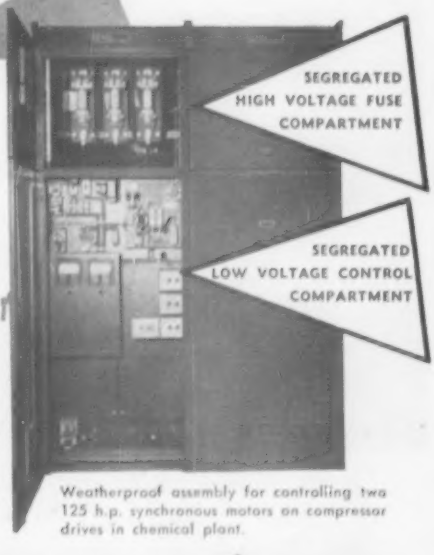

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• **Houston Texas Gas & Oil Co.**
Project: 960 miles between Baton Rouge, La., and Miami, Fla.: 507 miles of 30-in., 157 miles of 26-in., 61 miles of 20-in., 224 miles of 12-in., plus 500 miles of sales laterals in Florida, with main line joining Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.

• **Iron Ranges Natural Gas Co.,** St. Paul.
Project: 68-mile transmission line and 47 miles of laterals to supply town on the Mesabi Iron Range, Minn.
Status: Application pending with FPC.

• **Kansas-Nebraska Natural Gas Co., Inc.**
Project: 10 miles of 10-in. and 10 miles of 8-in. from Grand Island to Albion, Neb.
Status: Planned.
Completion: November 1956.

• **Lone Star Gas Co.**
Project: 230-mile line from Cotton County, Oklahoma, to Fritch, Tex., and a 205-mile line from Snyder, Tex., to hook up with the Cotton-Fritch line. Being contested by Natural Gas Pipeline Co. of America.
Status: Application pending with FPC.

Michigan Consolidated Gas Co.
Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.;** Floyd Huduall, spread superintendent, office at Cadillac, Mich.
Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.,** jointly with **J. L. Gentry Construction;** Frank Morris, spread superintendent, office at Hart, Mich.

• **Michigan Wisconsin Pipe Line Co.**
Project: 252 miles of 24, 18, 12, 6 and 4-in. loops in Wisconsin.
Status: Has FPC permit.
Completion: November 1956.
Project: 149 miles of loops in Wisconsin and Illinois.
Contractors: **H. C. Price Co.** and **Houston Contracting Co.** Price will build 56 miles of 24-in., and Houston will build 42 miles of 20-in. and 51 miles of 16-in. (being handled by Latex Construction Co. of Georgia), spread office at Fond du Lac, Wis.

• **Midwestern Gas Transmission Co.**
Project: Will build main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in., 648 miles of 3 to 18-in. extensions in Minnesota and Wisconsin.
Status: Application pending with FPC.

Montana-Dakota Utilities Co.
Project: 28 miles of 12-in. from Fallon County to Dawson County, Montana.
Status: Under way.
Contractor: **Ross Powers Construction Co.,** Billings, Mont.

Montana Power Co.
Project: 75 miles of 6-in. from Big Coulee field to Lewiston and Harlowton, Mont.
Status: Under way.
Contractor: **O'Connor Construction Co.,** Fromberg, Mont.

• **Mountain Fuel Supply Co.,** Salt Lake City.
Project: 38 miles of line to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.
Status: Has temporary FPC permit.

• **Natural Gas Pipeline Co. of America**
Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex., which is being contested by Lone Star Gas Co.
Status: Has FPC approval.
Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and for 91 miles of 30-in. loops along parts of its main line.
Status: Application pending with FPC.

• **New York State Natural Gas Corp.**
Project: 17 miles of 30-in. from Caton to Horseheads, Steuben County, New York.
Status: Under way.
Contractor: **Williams-Austin Co.**
Completion: November 1, 1956.

Niagara Mohawk Power Corp.
Project: 272 miles of 2 to 12-in. distribution mains for growth of service area in central, eastern, and northern New York.
Contractors: Various.
Completion: December 31, 1956.

• **North Carolina Natural Gas Corp.** (Subsidary of Colonial Natural Gas Corp.)
Project: 575 miles of 3 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across north Carolina.
Status: Has permit from North Carolina Utilities Commission.

• **Northern Natural Gas Co.**
Project: 307 miles of branch lines and 348 miles of main line in Wisconsina, Minnesota, South Dakota, and Iowa. Main lines include 169 miles in Duluth-Superior area, 164 miles in Aberdeen area of South Dakota.
Status: Application pending with FPC.
Project: 73 miles of 20-in. from Savana Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.
Status: Planned.

• **Offshore Gathering Corp.,** Houston.
Project: 364 miles in Gulf of Mexico off

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Pipeline Patrol

Louisiana.; 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in.

Status: Application pending with FPC.

• **Pacific Gas & Electric Co.**

Project: 37 miles of 20-in., 37 miles of 18-in. 9 miles of 12-in. from Beehive Bend field near Willows, Calif., to near Davis, then to Sacramento.

Status: Planned.

Project: 135 miles of 34-in. looping of the Topock-Milpitas line.

Status: Under way.

Contractor: A joint-venture firm, Midwestern-Johnson-Dixon, has 85 miles to complete this year.

Completion: Major part to be laid in 1956; 62 miles in 1957.

• **Pacific Northwest Pipeline Corp.**

Project: 37 miles of 6-in. from Dove Creek Nucla, Colo., and 13 miles of 4-in. from Nucla to Urvan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of America.

Status: Has FPC permit.

Project: 156 miles of 20 and 16-in. laterals from main line to Spokane, and 129 miles of laterals into Idaho.

Status: Under way.

Contractor: **R. H. Fulton & Co.**

Completion: Fall 1956.

Permian Basin Pipeline Co.

Project: 19 miles of 16-in. in Andrews, Tex.

Contractor: **R. H. Fulton & Co.**

• **Piedmont Gas Co.**, Hickory, N. C. (Parent is Carolina Natural Gas Corp.)

Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.

Status: Application pending with FPC.

Reynolds Sales Co.

Project: 20 miles of 10-in. in Corpus Christi Bay and Oso Bay.

Contractor: **Collins Construction Co.**; F. T. Glascock, project manager; Fred Wakefield, general superintendent, office at Gregory, Tex.

Southern California Gas Co. and Southern Gas Co. of California

Project: 241 miles of 30-in. from the outskirts of Los Angeles to Topock on the Arizona-California border.

Status: Right-of-way and ditch under way; pipe laying begins in January, 1957.

Contractor: **R. H. Fulton & Co.**

Completion: June 1957.

Project: 49 miles of 30-in. from Newhall to Alhambra, Calif.

Status: Under way.

Contractor: **Joe E. Young Contractors, Inc.**, have 19 miles.

Completion: December 1, 1956.

• **Southern Natural Gas Co.**

Project: 39 miles of loops near Atlanta.

Status: Has FPC permit.

• **Tennessee Gas Transmission Co.**

Project: 61 miles of 26-in. looping from near Newcomerstown to near Lisbon, Ohio (remainder of 142 miles of looping in Ohio).

Status: Under way.

Contractor: **Oklahoma Construction Co.**; Gene Gohring, spread man, office at Carrollton, Ohio.

Completion: Fall 1956.

Project: 63 miles of 30-in. looping from Scottsville to Cave City, Ky., and from southwest of Danville to northeast of Danville.

Status: Under way.

Contractor: **H. C. Price Co.** has 20 miles; C. E. Shivel, spread superintendent, office at Danville.

Project: 99 miles of 26-in. looping from Greenup, Ky., to north of Ohio River, from McConnellsville to Newcomerstown, and from Lisbon, Ohio, to near Mercer, Pa.

Status: Has FPC permit.

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Project: 30 miles of 8 and 12-in. laterals near Golden Meadow and Leeville, La.
Status: Under way.
Contractor: **Houston Contracting Co.**; H. E. Murphy, spread superintendent, office at Golden Meadow.

• **Texas Eastern Transmission Co.**
Project: 422 miles of 30-in. from McAllen to Beaumont, Tex., to move imported Mexican gas.
Status: Pending FPC approval.
Project: 530 miles of 30-in. looping from Kosciusko, Miss., to Uniontown, Pa.
Status: Pending FPC approval.

Texas Gas Transmission Corp.
Project: 120 miles of 20-in. and 11 miles of 16-in. from near Eunice, La., east to near Thibodaux, La.
Status: Work to start late October.
Contractor: **Houston Contracting Co.** Spreads: 11 miles of 16-in. and 50 miles of 20-in. from near Eunice to near New Iberia, F. A. Silar, spread superintendent, office at Crowley, La.; 45 miles of 20-in. from near New Iberia to near Morgan City, M. L. Thompson, sperad superintendent, office at Jeanerette; 25 miles of 20-in. from near Morgan City to near Thibodaux, W. H. Hayes, superintendent, office at Thibodaux.

• **Trans Carolina Pipe Line Corp.**, Commercial Building, Raleigh, N. C.
Project: 300-mile system across North and South Carolina, plus 500 miles of laterals.
Status: FPC approval pending

• **Transcontinental Gas Pipe Line Corp.**
Project: 160 miles of 36-in., 67 miles of 30-in., 24 miles of 24-in. loops from Louisiana to Pennsylvania.
Status: Pending FPC approval.
Completion: December 1, 1956.
Project: 25 miles of 36-in. loops from Louisiana to South Carolina, 31 miles of 36-in. and 43 miles of 30-in. line.
Satus: Pending FPC approval.

Foreign Crude-Oil Pipelines

Arabian American Oil Co.
Project: 140 miles of 20-in. from Safaniya field to Ras Tanura, Saudi Arabia.
Status: Under way.

B-A Alberta Pipe Line, Ltd.
Project: 35 miles of 8-in. to connect Drumhell field, Alberta, with existing lines running to Edmonton.
Status: Pending approval.

Interprovincial Pipe Line Co.
Project: 151 miles of 20-in. to extend present line from Sarnia to Port Credit, Ont.
Status: Pending approval of Board of Transport Commissioners. If approved, work will start spring 1957, end that fall.

• **Mene Grande Oil Co.**
Project: 11 miles of 6-in. from Elias to Fria, and 10 miles of 10-in. from Limon to Leona-Dacion lateral, Venezuela.
Completion: First quarter 1957.
Project: 24 miles of 12, 14, 16-in. from Oficina Tank Farm to Oveja.
Completion: Late 1956.

Pembina Pipe Line, Ltd.
Project: 100 miles of 3 to 10-in. gathering system in Pembina field.
Contractor: **Sparling Davis Co., Ltd.**

Pemex
Project: 50 miles of 20-in. from Angostura to Veracruz.
Status: Under way.
Contractor: **Constructora El Aguila, S.A.**; Antonio Sanz Polo, spread man, office at Veracruz.

• **Royal Dutch-Shell**
Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, and Netherlands, and Belgium. Main trunk to be 30-in.
Status: Company is considering project together with several other companies.

• **Sinclair Oil Corp. and Socony Mobil Oil Co.**
Project: 211 miles of 20-in. from the Silvestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.
Status: Planned.

Union of Soviet Socialist Republic
Project: 2,300-mile Trans-Siberian crude and products line from Ufa and the Tuimaza fields in Bashkiria to Irkutsk near Lake Balkal.
Status: Under way.

Yacimientos Petroliferos Fiscales (Argentina)
Project: 700 miles of 12-in. from Campo Duran to San Lorenzo.
Status: Under way.
Contractor: **TECHINT** (Compania Tecnica Internacional), Buenos Aires, has 90 miles.

Yacimientos Petroliferos Fiscales Bolivians (Y.P.F.B.)
Project: 160 miles of 10-in. and 43 miles of 8-in. from Sicascia to Arica on the Chilean coast.
Contractor: **Williams Brothers Co.**
Completion: December 1957.

• **Estrada de Ferro Santos a Jundial Departamento Oleducto**
Project: 6 miles of 14-in. from Capauva refinery to Utinga Terminal.
Status: Planned.
Completion: December 1956.

Hydrocarbons Pipeline Co. (Subsidiary of Canadian Hydrocarbons)
Project: 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Fort William, Ont.
Status: Has permit from Parliament of Canada. If approved by Federal Board of Transport Commissioners and the Alberta

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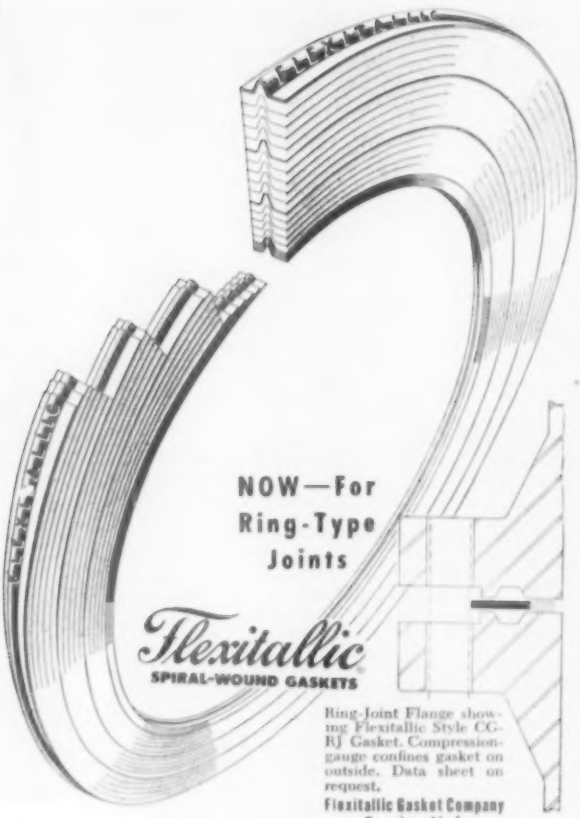

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GOTKOOL Water Cans and Coolers are easily portable for field use, and are ideal for use in office, store, and plant. Both **Gotkools** have extra large top openings. Snug-fitting, easily removable top protects drinking water from dust and contamination. Heavy construction with double-locked, sweat-soldered seams. *Buy* **Gotkool** *at your supply store today.*

GOTKOOL Water Cooler – made in 1½-, 2-, 3-, 5-, 10-, 15-, and 20-gallon sizes with either extended or recessed, flush-mounted faucet. *Note:* 15- and 20-gallon sizes available with extended faucet only.

GOTKOOL Water Can – made in 1½-, 2-, 3-, 5-, 10-, 15-, and 20-gallon sizes without faucets.

H. P. GOTT MFG. CO.
WINFIELD, KANSAS

KEEP PURE DRINKING WATER ALWAYS HANDY

"Here comes your QD Sheave—the original two-piece design."

Did we say
quick delivery!

Hope to tell you we said quick delivery. Meant it, too. On Worthington QD sheaves and Worthington-Goodyear V-belts the delivery you get couldn't be quicker.

QD stands for Quick Detachable—a perfect monicker for the original two-piece sheave because it's so easy to get on and off the shaft—holds tight, too.

And when you're using QD sheaves and V-belts you've got no supply problem. Your Worthington distributor (or local supply store) stocks most sizes—can get others rushed from nearby warehouses. Call him today and say Worthington "QD"—for Quick Detachable and quick delivery. *M1.64*

WORTHINGTON

Buy These Worthington Standard Products From Your Local Distributor

COMPRESSORS • PUMPS • MULTI-V-DRIVES • VARIABLE SPEED DRIVES

Pipeline Patrol

Petroleum and Natural Gas Conservation Board, work will start early 1957.

Construction consultants: **Williams Brothers, Calgary,** and **A. D. Little & Co.,** Boston.

- **Imeprial Oil, Ltd.**

Project: 38 miles of 12-in. loops along present line from Waterdown, Ont., to Toronto.

- **Iraq Petroleum Co., Ltd.**

Project: 75 miles of 24-in. from Homs, Syria, to Tripoli, Lebanon.

National Iranian Oil Co.

Project: 573 miles of 10-in. from Ahwaz to Teheran, Iran.

Contractor: Enterpose of Paris, has northern 236 miles.

- **North Atlantic Treaty Organization (NATO)**

Project: 2,000 miles of lines to airfields in parts of Europe.

Status: Under way.

Contractors: **Associated Pipeline Contractors, Inc.,** has 450 miles from Iskenderun, Turkey, to Batman. **TECHINT** (Compagnia Tecnica Internazionale), Milano, Italy, has 205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir. Bids were taken in January 1956 on 300 miles of 12-in. between Marseille and Langres, France.

Pemex

Project: 155 miles of 12-in. from Tampico to Cd. Victoria.

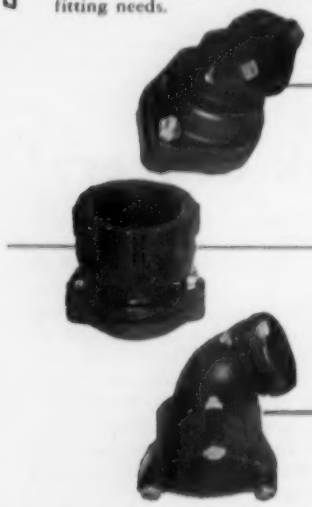
Contractor: **Constructora El Aguila, S.A.;** Geronimo Aviuchastegui, spread man, office at Tampico.

YOU JUST CAN'T BEAT

SLIP-ON'S*!

You can accomplish maximum economy by using Enardo **SLIP-ON** fittings for all low pressure fitting installations. Some users have reported a 50% savings in time and money because of their labor saving qualities. No unions are needed with Enardo **SLIP-ON** fittings, which means easier, faster, and cheaper lease installations.

Consult your Enardo salesman or call the Tulsa office for your own particular fitting needs.



4" to 3" and 4" to 2" **SLIP-ON** 45° reducer ells. Principally designed for use in equalizer line installations.

4" N.P.T. to 3" **SLIP-ON** reducer connections. For connections between screwed end pipe and blank end pipe. Also used for water-leg installations.

6" to 4" **SLIP-ON** 90° reducer ell. General purpose fitting for installations where working pressures do not exceed 150 p.s.i.

*Reg. T. M.

ENARDO manufacturing company

BOX 1967 • TULSA, OKLAHOMA

Foreign Natural-Gas Pipelines

- **Alberta Gas Trunk Line Co.**

Project: 547 miles of gathering system for the Trans-Canada line, to connect the following fields: Pincher Junction, Provost, Sibbald, Oyen, Sunnynook, Steveville, Cessford, Counteas, Duchess, Princess, Homeglen, Rimbey, Nevis.

Status: 40 miles of 34-in. to be laid in 1956; remainder to be laid in 1957 and 1958.

Andes Pipeline Corp. (Subsidiary of Glenn McCarthy, Inc.)

Project: 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper-mining area.

Contractor: Will do own work.

- **Attock Oil Co.**

Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.

Status: Planned.

Cia. Shell de Venezuela.

Project: 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula, to fuel refinery furnaces.

Status: Planned.

Completion: 1957.

- **Empresa Nacional Del Petroleo.**

Project: 80 miles of 10-in. from Concon to Santiago, Chile.

Status: Planned.

Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey in northern Mexico.

South Alberta Pipe Line, Ltd.

Project: 150 miles of 8-in. from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta.

Status: Filed for permit.

Sui Gas Transmission Co.

Project: 188 miles of 16-in. from Sui gas field to Moultan, Pakistan.

Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang Magiana, and Montgomery.

Contractors: **Pakistan Constructors,** a joint company of **Morrison-Knudsen** of Boise, Idaho, and **William Press, Ltd.,** of London.

- **Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venezuela.**

Project: 321-km., 26-in. line from Anaco to La Mariposa near Caracas.

Status: Proposed.

- **Trans-Canada Pipe Lines, Ltd.**

Project: 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. (First part of 2,250-mile line from Alberta to Toronto and Montreal.)

Status: Under way.

Contractors: **Majestic Contractors, Ltd.; Canadian Bechtel, Ltd.; Mannix, Ltd.; Dutton-Williams Brothers, Ltd.** has 100 miles of 34-in. Three sections still to be let.

Union of Soviet Socialist Republic.

Status: Under way; approximately 50 per cent completed.

Westcoast Transmission Co., Ltd.

Project: 650 miles of 30-in. from Peace River area, Canada, to Sumas, Wash.

Status: Under way.

Contractors: **Dutton-Williams Brothers, Ltd.,** has 120 miles from Taylor, B. C., to Azouzetta Lake, O. Graves, spread man, office at Dawson Creek, B. C.; **Mannix, Ltd.,** has 110 miles between Huntingdon and Merritt, Fred Byers, spread superintendent, office at Chilliwack; **Canadian Bechtel, Ltd.,** has 210 miles from Alexandria to Pine Pass, B. C., H. F. (Hank) Mogg, spread man, office at Quesnel, B. C.; **R. A. Conyes Construction Co.,** has 210 miles.

Completion: Dutton-Williams section to be completed November 1957. R. A. Conyes section to be completed September 1957.

Clevelands dig through swamps and hills for 327-mile 18" products line in working space only 35' wide

Oklahoma Pipe Line Constructors are cashing in on the compact design, reversible discharge conveyors and rugged digging ability of their Cleveland trenchers in the construction of this 18" products line for the Plantation Pipe Line Company. Construction operations are restricted to a working space only 35 feet wide because pipe is being laid alongside existing 12 and 18" lines under load in the original right-of-way. Two Clevelands are being used to cut trench 42 to 54 inches deep for the 327-mile line extending through swamps and rolling hills from Baton Rouge, La. to Helena, Ala., near Birmingham.

• The Cleveland 240, shown above, is only 8-feet wide over its non-packing, bearing-sealed crawlers—a perfectly balanced, powerful trencher that easily negotiates the wettest rights-of-way and overcomes the toughest hills—digs up to 3 feet in width and down to 6 feet, 3 inches in depth.

Good Everywhere

THE CLEVELAND TRENCHER COMPANY

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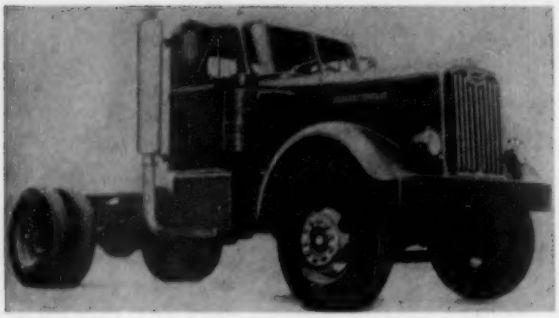
The OIL AND GAS JOURNAL

Showcase

OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller



Tractor Offers Payload Advantages

Offering payload advantages, these new truck tractors are lightweight. Originally developed for the West Coast, they have since been made available for a variety of heavy-duty applications in all parts of the country, with either axle-forward or axle-back models.

Weight saving was accomplished principally by the use of aluminum. The lightweight models, DC-102TL and DC-10264L tandem axle, have all-aluminum driver's cab which features a strong but lightweight-aluminum skin over a girder-type frame of aluminum alloy. Formed channels are heliarc welded. The aluminum skin is riveted to the frame, using an aircraft-production technique. This construction permits flexibility and stress absorption without danger of cracks and accomplishes a weight savings of 20 per cent in the cab structure.

Aluminum is employed in various parts of the engine, in the chassis crossmembers, transmission case and cover, fuel tank, front and rear-axle hubs, hood and front bumper. Many of these parts are of all-aluminum castings or weldments. Even the wheels are of forged aluminum.

A 165-hp. Cummins powers the models. **For more information write or call: The White Motor Co., Autocar Division, Cleveland 1, Ohio.**

●

Pipe Cleaner Propels Self, Cleans Loaded Pipelines

A new self-propelled, rotating-head pipe-cleaning machine cleans loaded pipelines. Perfected after 2 years of design and experimentation, this new machine enables two men to clean up to nine times more pipe in one day than can be handled by such other methods as hand cleaning and rocker-type cleaners. It eliminates the need for air compressors or electric generators.

Requiring only 6 in. of clearance under the line, the complete unit consists of a revolving head and a separate power plant which is easily mounted to the revolving head. Both the revolving head and the power plant on the larger models can be quickly mounted to the line by two men. Once the unit is mounted it can easily be handled by one man.

The revolving head is adjustable to any required travel speed and uses standard cutters, knives, or brushes.

The new Model C/M pipe-cleaning

machines are available in four models with each model capable of cleaning three successive sizes of pipe. Pipe sizes that can be handled by the ma-

---

OIL AND GAS JOURNAL **Showcase Coupon**

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Described in the Oct. 15, 1956, issue of The Oil and Gas Journal

NAME _____ TITLE _____

COMPANY _____

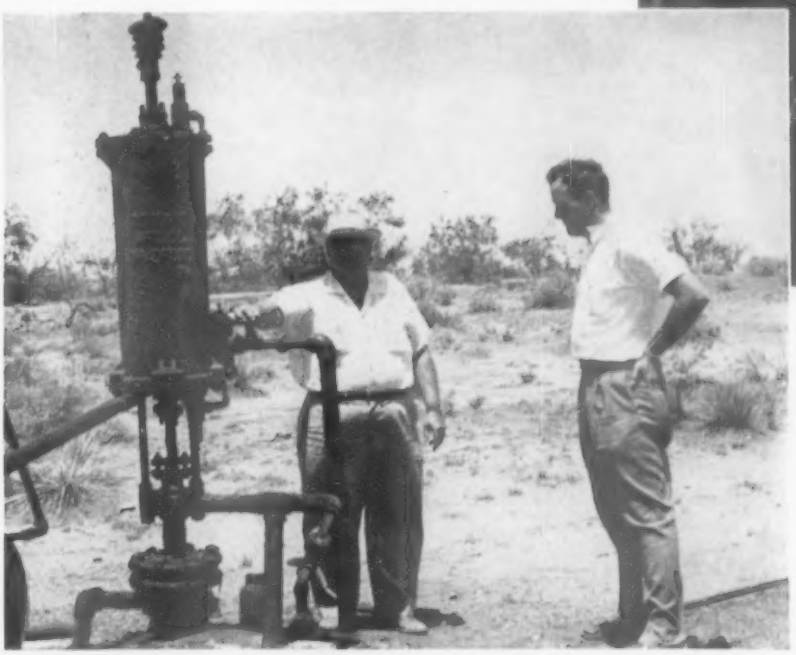
ADDRESS _____

CITY _____ STATE _____

DATE _____

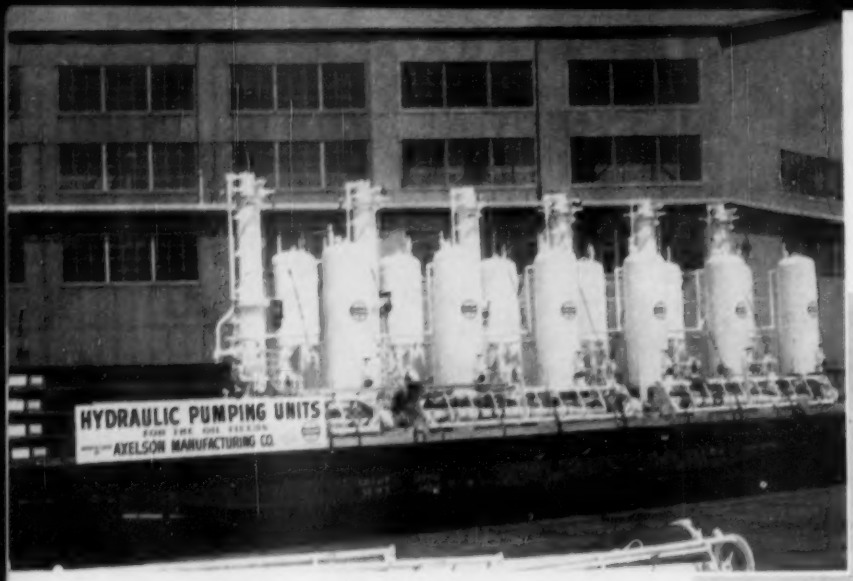
AXELSON PICTORIAL

WISE GUYS: This pair of baby horned owls was found by Windy Greene, Store Manager for Jones & Laughlin at Russell, Kansas, and Jimmy Drake, Axelson Representative, during a week-end fishing trip on the Saline River. The birds were in a tree nest wolfing down a large jack rabbit that the mother owl had caught for them. They made an Axelson working barrel their perch in the pump repair shop at Russell. Living on hamburgers and raw beef liver, a bird collector from Great Bend took pity and gave them a home. They are now twice this size; each bird weighs over 20 pounds.



AIR LIFT. While drilling this well (McClure #1, Scurry County, Texas), a high-pressure gas pocket was hit at 1,200 ft. It was harnessed and used to actuate the sucker rod string through an "air-operated head." Air pressure is 200 psi, depth is 2,400 ft., production 4 B/D of 27 gravity oil. An Axelson 1½" bore Sure-Seal Pump has been in service for eight years without being pulled. L. M. "Woodrow" Wilson (l.) Production Superintendent for W. S. Guthrie Oil Company (producer) and Forest Goin, Axelson Representative, check pressure.

BUYERS' MARKET. Well known among oil men is Curt Oppel (center), Resident Purchasing Agent for the Atlantic Refining Company in their Dallas office. He is now in his thirtieth year with the Company. Flanked by his assistant, J. W. Crittenden (l.) and E. L. Chandler, Axelson Representative, Oppel has just signed an order for 40,000 feet of No. 60 Axelson Sucker Rods for East Texas wells.



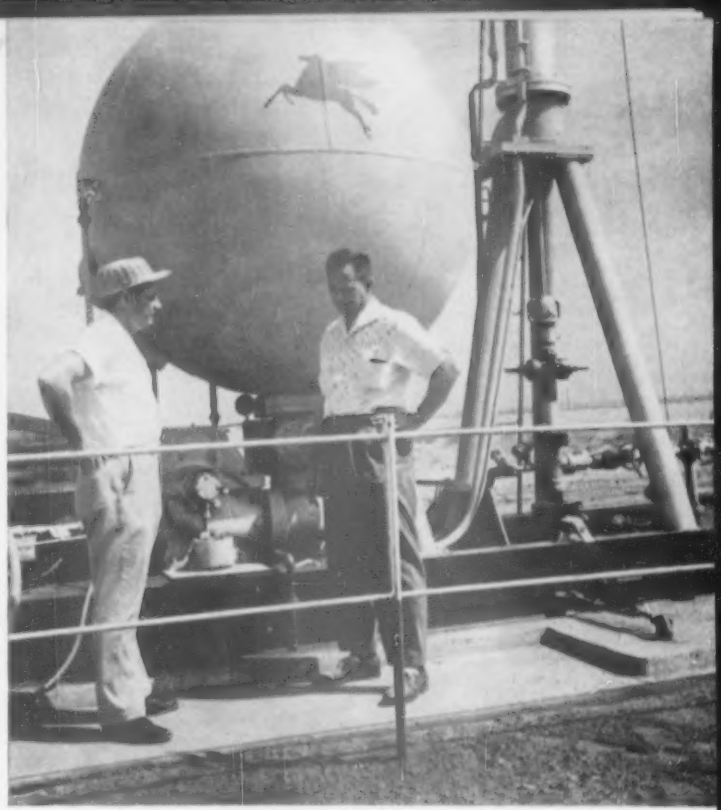
AXELSON

CARLOADINGS UP. These 10-foot counterbalanced units leaving the Axelson plant at Los Angeles are headed for the Dominion Oilfield Supply Company, Calgary where they will be installed in Alberta's rugged Pembina Field. The newest addition to the line of Axelson hydraulic pumping units have an 18,000 lb. rod load capacity and can pump efficiently at eight strokes per minute.

DEFIES GRAVITY. About 30 miles south of Big Lake in Crockett County, Texas, this Axelson Long-Stroke Hydraulic Pumping unit raises sweet oil (39 gravity) from 6,200 ft. for Continental Oil Company. Five of the 40 producing wells in this water flood project (Todd-Crinodal) are equipped with Axelson Long-Strokers. Milton Barber, Project Engineer for Continental, in foreground.

6-FOOTER. Here on a stripper well near Kilgore, Texas, is a typical Hydrax hydraulic pumping unit. Jud Hemperly, Production Foreman for F. A. Fuller Company, checks the six-foot stroke length. He had an abrasive sand condition but the slow, smooth pumping cycle has reduced the fluid turbulence and ended this problem. This unit produces 32 gravity oil from a depth of 3,600 ft.

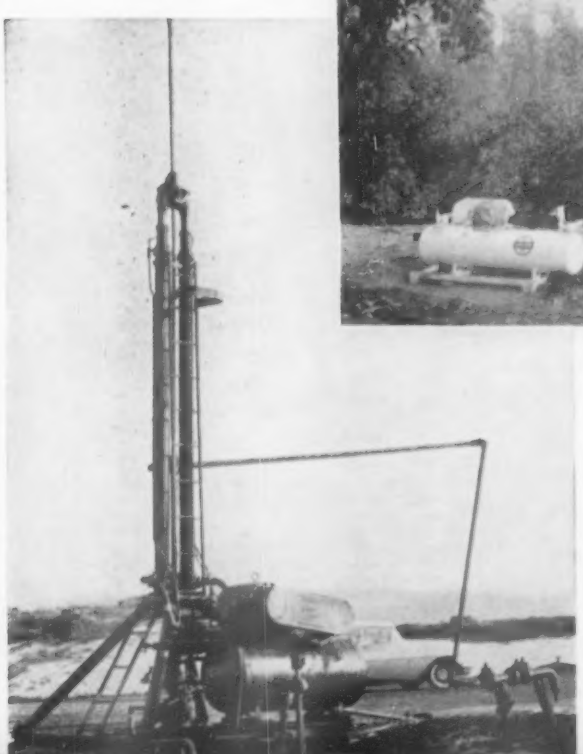
HYDRAULIC PUMPING. *On these two pages are illustrations of the four types of hydraulic pumping units that Axelson makes. They handle any producing depth from shallow, low-production pumpers to deep, high-volume wells. Stroke lengths range from four to 26½ feet. Some units are balanced, some are non-counter-balanced. Special units pump low viscous oil, multiple units pump from a single power source. Many are performing jobs economically that have never been done so before, without rod breaks and mechanical failures.*



RIGSIDE. Magnolia Petroleum Company has 18 of these Axelson Long-Stroke Hydraulic Pumping Units on their Southeast Nolley Lease in Andrews County, Texas. In front of the E. E. Nolley #1 is Charles Hickok (l.) Magnolia Petroleum Engineer, and Roy Grigsby, Axelson Hydraulic Sales. This well makes its allowable of 157 B/D of 32 gravity oil from 9,400 ft. with an Axelson tapered rod string (⅞", ¾", ⅝").

SMALL FRY. The four-foot Hydrax Jr. is a small, economical pumping jack for low-production and stripper wells. It mounts directly to the tubing nipple and requires no foundation. It can be installed within three hours. All controls are at ground level. Rod capacity is 8,000 lbs. First units were put on test, last Spring, and proved so successful that Axelson is now in full scale production with the Hydrax Jr.

AMAZON. Several hundred miles up the Amazon River, deep in the Brazilian jungles is the Novo Olinda Field. An Axelson Long-Stroke Unit is being installed on the first producing well in the region for Petrobras (Petroleo Brasiliero). The unit now pumps 425 B/D from 8,900 feet with an Axelson 1½ bore insert pump and an Axelson three-step sucker rod string.



NOTORIOUS. Called the "Double Ram," this unit was specially designed for Union Oil Company. There are 18 of these "Hydrax" units in the Guadalupe Field, California, pumping eight to 14 gravity oil from a depth of 2,800 to 3,100 ft. Pumping conditions here are notoriously rough. Sand cuts run as high as 50%. This unit operates at one stroke per minute (35 sec. on the upstroke, 25 sec. downstroke), lifting 65 B/D with an Axelson 2½" pump.

AXELSON PICTORIAL

HOT ONE. This is Amerada Petroleum Corporation's Mathers A#2, East Cap Rock Field, Lea County, New Mexico. An Axelson 2¾" bore TLE Pump lifts 1,350 B/D (75 bbls. net of 45 gravity oil). Total depth is 11,030 ft.; pump is set at 3,573 ft. Bottom hole temperature of 180° F. does not affect the pump. (l. to r.) Buck Cummings, Farm Boss; Carl West, Pumper; Gene Thomas, Resident Engineer (all of Amerada); Truman Coffee, Axelson Representative.

RETIRING. W. A. Underwood (right), Production Foreman for Cosden Petroleum for 13 years, retired on June 30, 1956, after 50 years of service in the oil fields. He poses for his picture beside the Patterson #1, Howard County, Texas, with Bernard Layman, Jones & Laughlin Field Representative. Axelson Sucker Rods and Plunger Pump are going strong in this well. Depth is 3,100 ft. Production is 100 B/D of 31 gravity crude oil.

NO. 7

AXELSON

AXELSON MANUFACTURING COMPANY

Division of U. S. Industries, Inc.

6160 South Boyle Avenue, Los Angeles 58, California

Specify **AXELSON** *for*
Subsurface Pumps
Sucker Rods
Hydraulic Pumping Units
Stuffing Boxes & Packing
for better production

Where to buy Axelson Production Equipment:

CALIFORNIA: *Axelson stores at Bakersfield, Coalinga, Huntington Beach, Long Beach, Orcutt, Santa Fe Springs, Taft, Ventura; Hickey Pipe & Supply Co. (Sucker Rods)* • **MID-CONTINENT:** *Jones & Laughlin Steel Corporation, Supply Division (Headquarters, Tulsa)* **ROCKY MOUNTAINS:** *Jones & Laughlin Steel Corporation, Supply Division; Great Northern Tool & Supply Co., Billings, Montana* • **CANADA:** *Jones & Laughlin Steel Sales Co. Ltd., Calgary; Dominion Oilfield Supply Co. Ltd., Calgary* • **MEXICO, D. F.:** *Wells Fargo & Co. Express, S. A.* • **RIO DE JANEIRO, BRAZIL:** *MAQUIP (Commercial de Maquinas e Equipamentos) S. A.* • **LIMA PERU:** *Gross Equipment, S. A.* • **LA PAZ, BOLIVIA:** *Del Prado & Compania, Ltd.* • **BUENOS AIRES, ARGENTINA:** *Adrian Bolland & Cia., S. R. L.* • **BARCELONA, VENEZUELA:** *Servicios Industriales, C. A.* • **MARACAIBO, VENEZUELA:** *Servicios Industriales, C. A.* • **BOGATA, COLOMBIA:** *Servicios Industriales, C. A.* • **TRINIDAD, B. W. I.:** *Industrial Agencies, Ltd.*

Where to buy Axelson Hydraulic Pumping Units:

CALIFORNIA: *Axelson stores (see above)* • **ODESSA:** *Axelson Warehouse* • *Industrial Supply Company stores at* **DALLAS, ELECTRA, FORT WORTH, FREER, HOUSTON, KAMAY, MIDLAND, ODESSA, SAN ANTONIO, SNYDER, TULSA, TURNERTOWN, WICHITA FALLS** • *Mountain Iron & Supply Company stores and offices at* **ANTHONY, AUGUSTA, BARTLESVILLE, DENVER, GREAT BEND, INDEPENDENCE, KIMBALL, LEROY, MADISON, McPHERSON, PARKERSBURG, PLAINSVILLE, RUSSELL, TULSA, WICHITA** • *Export (See above).*

chine range from 4 through 26 in. **For more information write or call: Remco Manufacturing Co., 8204 East Admiral Place, Tulsa, Okla.**

●

Retrievable Standing Valve Placed Anywhere in String

The Type A retrievable standing valve provides a means for placing a standing valve at any position in the tubing string. The tool is designed so that it does not swab either going in or coming out of the hole.

It may be pulled by wire line with as much as 3,000-psi. differential as it is designed to automatically equalize pressures when the fishing neck is lifted. A friction grab provided on the bottom of the tool will latch securely to the tubing stop. **For more information write or call: McMurry Oil Tool Specialists, 1020 Houston Avenue, Houston, Tex.**

●

Two-Way Base or Mobile FM Radio Employs a.c. or d.c.

The Bantam, a new low-power, two-way FM radio system provides communication in the 144 to 174-megacycle frequency range. Designed specifically for low-power limited-range communication applications as either a base or

mobile station, the Bantam operates from a wide variety of power sources, 6, 12, 24, 32 volts d.c. or 117 volts a.c. without modification, adjustment, or external converters. Choice of input voltage is accomplished by a front-panel selector switch, providing complete interchangeability between base and mobile applications.

The Bantam features dual-channel receiver and transmitter facilities, more than 1 watt of RF output power, 1.25 watts of audio power to a built-in phenolic-cone loudspeaker. The complete unit is housed in a fully enclosed, dustproof and weather-resistant reinforced-steel case. Limited space installation is facilitated by its compact size (6¼ in. high, 10⅛ in. wide, 11¾ in. long) and light weight (total 24 lb.).

Under normal operating conditions dependable communication is achieved over a 1 to 3-mile range and greatly in excess of this in free-space antenna locations.

Low primary power consumption, about 2 amp. at 6 volts d.c. and correspondingly less at the higher voltages, provides long, continuous operation with no danger of running down batteries in mobile installations. Easily set up in any type of installation, the Bantam is completely selfcontained and will provide operation regardless of the available power source. **For more information write or call: Mobile Products Department, Bendix Radio, Baltimore 4, Md.**

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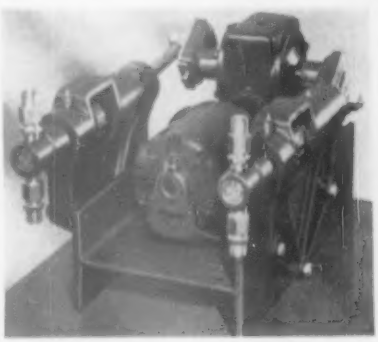

Chemical Pump Proportions From 0.8 to 900 G.p.h.

The new Model 1140 chemical-proportioning pump offers a large feeding accuracy, positive feed-rate setting, and economy of initial and upkeep costs.

The plug-in reagent end and other standardized mechanical components are readily accessible for easy servicing.

OIL AND GAS JOURNAL **Showcase Coupon**

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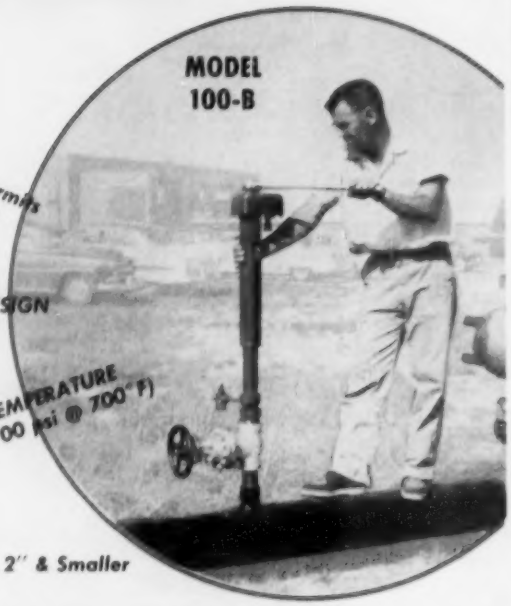
THE IMPROVED WmSON-HILLCO MODEL 100 TAPPING MACHINE



SHORTER LENGTH permits Taps in limited spaces

COMPACT, RUGGED DESIGN Insures longer life

HIGH PRESSURE—HIGH TEMPERATURE (1,440 psi @ 100° F or 700 psi @ 700° F)

TAP SIZES: 2" & Smaller

For the Plant and Field . . .

Three other sizes of WmSON-HILLCO Tapping Machines

MODEL 360
Taps to 6"—Hand operated

MODEL 660
Taps to 16"—Power operated

MODEL 1200
Taps to 36"—Power operated

MAXIMUM RATING, EACH MACHINE: 1,440 psi @ 100°F or 700°F @ 700 psi

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T.D. Williamson, Inc.

P. O. BOX 4038 TULSA 9, OKLAHOMA

REPRESENTATIVES: HOUSTON • PITTSBURGH • PLAINFIELD, N. J. • AMARILLO • JOLIET, ILLINOIS • LOS ANGELES • SAN FRANCISCO • BARTLESVILLE, OKLA. • SEATTLE • EDMONTON, LONDON, ONT. • CALGARY • VANCOUVER, B.C. • BUENOS AIRES • CABIMAS, ZULIA, VENEZUELA • DURBAN, NATAL, SOUTH AFRICA • PARIS, FRANCE

OIL AND GAS JOURNAL Showcase OF NEW EQUIPMENT

This pump also features the new Vane-Guide check valves with reversible seats. It employs minimum-clearance volume cylinders of self-purging design. All standard models are equipped with micrometer stroke-length adjustment, with in-motion rate adjustment available if desired. This compact, easily installed unit will handle feed rates from 0.8 to 900 g.p.h. and discharge pressures to 1,340 psig. **For more information write or call: Proportioneers, Inc., 345 Harris Avenue, Providence, R. I.**

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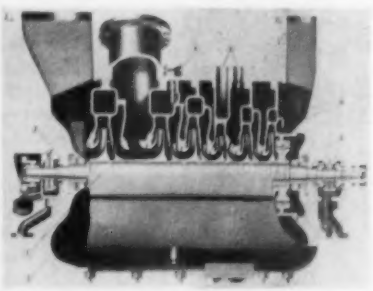


Multistage Compressor Ranges to 950 Psig.

For use with air, ammonia, and most hydrocarbons, this new multistage compressor employs five casing sizes to give a capacity range from 570 to 82,000 cu. ft. per minute per casing. Discharge pressures range to 950 psig.

Five features of the new compressor are: (1) casings and diffusers are horizontally split at the centerline with no bolting of the diffusers to the casing; (2) the bearings are externally mounted to the casing and are open to atmospheric pressure; (3) accommodations for large bleed-in bleed-out flows permit handling of different levels of refrigeration or stepwise compression of process loads and knockouts with one compressor casing; (4) liquid interstage-injection cooling reduces heat of compression; (5) the horizontally split enclosed diffusers allow continuous gas guidance through compression range. **For more information write or call: Worthington Corp., Harrison, N. J.**

●

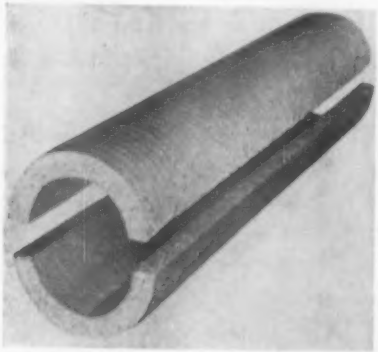
Pipe Insulation Withstands Heat Up to 1,350° F.

Kaytherm, a new wide-temperature-range molded insulation is designed for use on steam and heated process piping.

This low-conductivity insulation withstands pipe temperatures up to 1,350° F.

Kaytherm, which is produced in half-cylindrical sections and segments 36 in. long, is easy to install requiring only simple encircling metal bands to fasten two mating sections to a pipe. It can be cut easily and worked with ordinary tools. This wide-temperature-range pipe insulation comes in a variety of thicknesses ranging from 1 to 4 in. and will accommodate pipes up to 33 in. in diameter.

Kaytherm pipe insulation is made by reacting lime and diatomaceous earth under suitable conditions of heat and water to form a hydrous calcium silicate which is bonded together with asbestos fibers. This chemically stable insulating material has many of the favorable characteristics of fine concrete such as strength, wear resistance, and dimensional stability.



The largest produced sections of Kaytherm are lightweight and easy to handle. Kaytherm is flame-resistant and chemically inert and insoluble in water. Its compressive strength permits it to be laid over any irregular shapes, bolts, and depressions and held tight without concern of breakage. **For more information write or call: Keasbey & Mattison Co., Ambler, Pa.**

●

Liquid-Level Controller Utilizes Torque Table

A new design of displacement-type liquid-level controller eliminates both bearings and knife edges, providing trouble-free control for all services.

Called the Flexotrol liquid-level controller, the new design introduces a torque table which replaces pivoting members. The face of the torque table, engaging and driving the torque tube, is free to twist under the action of the displacer. Since there is no dependence on sharp edges, performance of the controller is essentially constant and normal process residues do not hamper operation.

Flexotrol liquid-level controllers are

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available with external-displacer chambers or in models for direct-displacer immersion in the process vessel. As an optional feature, direct mechanical liquid-level indication can be provided as a final and complete check on the pneumatic system. Direct-reading scales simplify adjustment for a broad specific-gravity range. Control action is interchangeable for proportional or differential gap response; proportional

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band is 1 to 150 per cent with automatic reset as an extra feature. **For more information write or call: Kieley & Mueller, Inc., 64 Genung Street, Middletown, N. Y.**

●

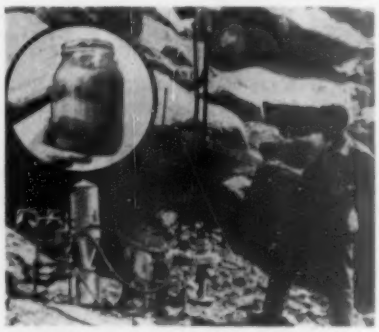
Portable Rotary Air Drill Makes Hole to 100 Ft.

A compact, portable rotary-drilling system weighing only 125 lb. removes all cuttings from the hole by vacuum. Known as the Mighty Midget, the gasoline-powered rig is easily carried by two men, facilitating use in rough terrain impossible to reach by truck or car. The unit is quick to set up and the rotary table can be swiveled to drill at any angle, vertical or horizontal.

High-velocity air cools the bit and lifts the cuttings internally through the drill stem. Cuttings are separated from the exhaust and are deposited in a transparent glass container in the order removed, furnishing visible core samples easily correlated to depth.

The vacuum system requires no water, frequently impossible to supply or transport. It also insures against loss of circulation in fissures or broken formations and eliminates any possibility of contaminating cores.

The Mighty Midget drills a 1¾-in. hole up to 100 ft. deep in dry formation and uses a 9-hp. McCulloch engine. Among its many applications are shot and blast-hole operations, exploratory mining, location of water strata, evaluation of underground deposits, geophysical work, earth sampling, and drilling of holes to water for establishment of satisfactory ground connections for telephone and electrical circuits. **For more information write or call: Houston Tool Co., Santa Susana, Calif.**



●

New Safety-Relief Valve Handles Air, Gas, or Water

A safety-relief valve designed to withstand pressures up to 10,000 psi. provides high capacity of liquid flow at 25 per cent over pressure. It handles air, gas or liquid and has been fully proved under field test conditions.

The new valve has close blow-down control on expansible gases and vapors. It is ideal for all systems handling crude oil, sour gas, and oil vapors, including hydraulic-control systems, high-pressure gas systems, and high-pressure separators.

The valve body is a heavy carbon-steel casting. The stainless-steel inner-valve parts are so constructed and assembled that there is no stress around the seating area, thus assuring a leak-tight seal after long periods of operation. Narrow, 45° seats offer less resistance to flow, and less surface area to catch abrasive matter.

The valve is made in ½, ¾, and 1-in. sizes. It can be furnished in all stainless steel or other alloys for petrochemical service. **For more information write or call: Fluid Mechanics Division, Protek Specialty Co., P. O. Box 194, Bellaire, Tex.**

H&M the only line

OF PIPE CUTTING AND BEVELING MACHINES OFFERING

A COMPLETE RANGE of 1½" to 36" in DIAMETER!

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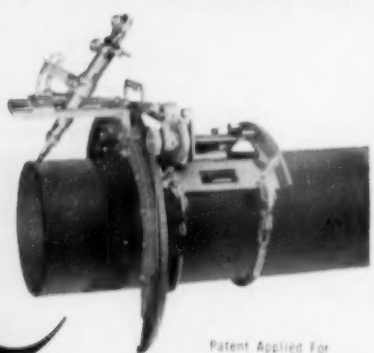

Patent Applied For

Again, H&M paces the field by providing the only complete line of lightweight, portable pipe cutting equipment based on the famous H&M horseshoe split gear principle, with models for 1½" to 4" — 4" to 8" — 8" to 12" — 14" to 20" — 22" to 26" — 26" to 30" — 28" to 36"! Write today for fully illustrated details on the full H&M line.

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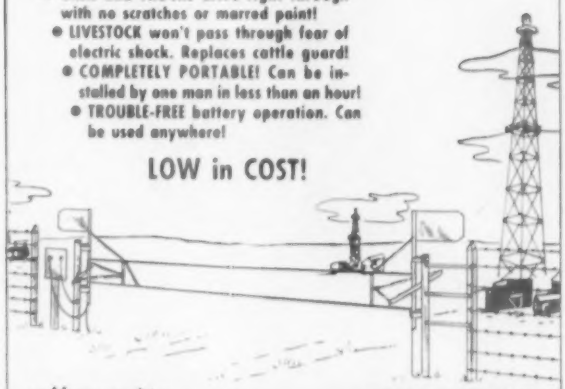

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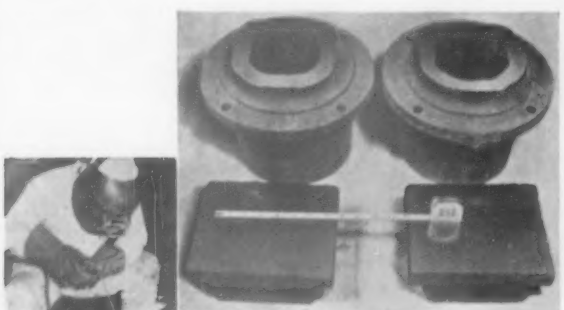
Longer Valve Life with Colmonoy Hard-Facing

Catalyst slide valve gates, throats, and bodies last up to five times longer when hard-faced with Colmonoy No. 1 electrodes. The success of Colmonoy No. 1 in resisting erosion by catalytic fluids has made it the standard material for hard-facing slide valves by many maintenance shops, job shops, and valve manufacturers.

Colmonoy No. 1 electrodes have a new metallic coating that improves arc stability, permits vertical welding, and eliminates weld cleaning between successive passes. This reduces welding time to cut the already low cost of reclaiming valves with Colmonoy hard-facing.



Two 8 inch slides and throats after being reclaimed with Colmonoy No. 1 (shown finish ground)

A valve slide being hard-faced with Colmonoy No. 1 electrodes.

Write for Colmonoy Hard-Facing Manual #79 for more about Colmonoy hard-facing alloys and methods.

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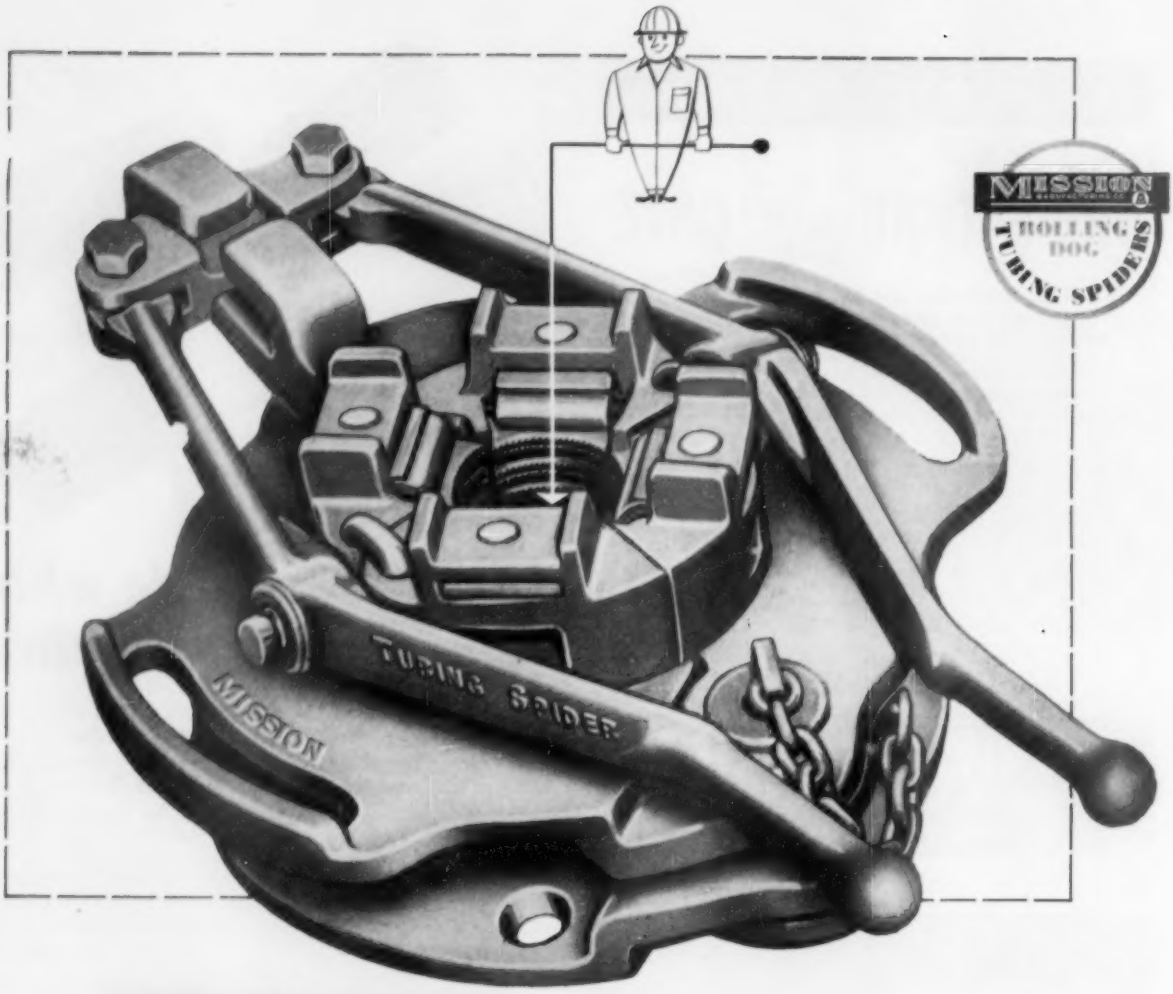

Mission Tubing Spiders feature "Rolling Dog" Slips for positive grip and instant release. This engineered feature— plus many others— assures fast tubing jobs and low costs.

Mission Tubing Spiders are made in both lightweight and deep well types. Buy the one that fits your needs from your favorite supply store-today!

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OIL AND GAS JOURNAL

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Oil Production History of the Southwest, a new 88-page booklet, itemizes information on the principal oil-producing formations in Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma, and Texas. The booklet offers a production history of the 69 principal oil formations in the Southwest. This breakdown lists the name of the fields, locations, discovery dates, proved acreage, and production figures through 1954. Description of the formation geology is included. **For more information write or call: Oil and Gas Department, Bank of the Southwest, P. O. Box 2629, Houston 1, Tex.**

●

Shortcuts to More Efficient Oil-Field Preparation and Drilling, an eight-page two-color folder, describes construction equipment at work on oil-field operations. On-the-job photos show crawler tractors, the 20-cu. yd. model 75 Payscraper, and power units performing such tasks as backfilling and powering a mud pump. Booklet CR-478-F presents attachments offered for the IH crawler line. **For more information write or call: Construction Equipment Division, International Harvester Co., 180 North Michigan Avenue, Chicago 1, Ill.**

●

Perforating, Logging, and Caliper Survey. Catalog No. 5758 covers this company's well services. Enlarged and illustrated, the publication includes sections on such services as bullet perforating, caliper survey, electrical well logging, and jet-gun perforating. One section titled "Simultaneous Radiation Logging" details information on log-temperature stability, log-zero stability, log-instrument dependability, and absolute calibration. **For more information write or call: Perforating Guns Atlas Corp., 7730 Scott Street, Houston, Tex.**

●

Results With the M-3 Bullet Perforator. A new eight-page bulletin featuring results obtained with the improved M-3 bullet perforator describes 13 actual perforating jobs performed under all types of conditions in the United States

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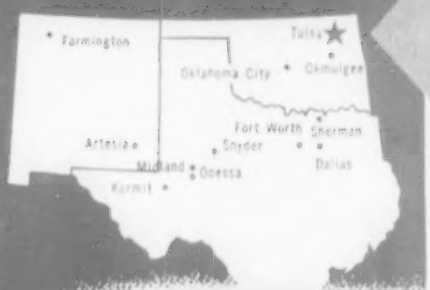

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and Canada. The versatility of the M-3 bullet gun and its capabilities under varied operating conditions is shown in this collection of recent job reports. Photographs, drawings, and cartoons illustrate the use and results of the perforator. **For more information write or call: McCullough Tool Co., 5820 South Alameda Street, Los Angeles 58, Calif.**

•

Locating Trouble in Pumps. A new two-color folder, prepared to help locate and correct common ailments of rotary, centrifugal, and steam pumps employs cartoon-sequence pictures. Bulletin PC-508 P gives a full description of pump troubles—from failure to deliver water to the loss of capacity after starting. **For more information write or call: Worthington Corp., Harrison, N. J.**

•

X-Ray Diffraction for Research, Production Control, and Profit is the title of a new four-page brochure. It discusses basic theory (Bragg's Law), definitions, analytical advantages, and applications in metallurgy, chemistry, and mineralogy. The brochure includes typical patterns of fundamental methods of crystal study. Two X-ray diffraction units are illustrated to describe the building-block principle for acquiring the G-E X-ray diffraction unit desired. **For more information write or call: General Electric, X-Ray Department, Milwaukee 1, Wis.**

Chemical Mixers and Feeders is an eight-page bulletin with illustrations and diagrams. Bulletin No. 350-E includes descriptions and performance data on mixers and feeders. It explains how paddles revolving in a vertical plane within the tank prevent stratification of a mixture. **For more information write or call: Infilco Inc., Tucson, Ariz.**

•

Walker-Neer C Series Well-Completion and Workover Spudders. Consisting of five three-drum models and four two-drum models, the C series offers time and cost savings in well completion, workover, and fracturing operations. Presented in a 12-page, 2-color booklet, this series of spudders features: maximum drum speed for rod and tubing operations, swabbing, and well servicing jobs; and a powerful, beam-type spudding action for drilling-in, deepening, cleanout, and fishing. The booklet includes photographs, spooling capacity charts, line pull and speed charts, and specifications. **For more information write or call: Walker-Neer Manufacturing Co., Inc., P. O. Box 2490, Wichita Falls, Tex.**

•

Pipecote, a Method of Cleaning and Coating Pipelines Internally in Place. A two-color, four-page folder makes use of drawings and photographs to describe this service. A large diagrammatic drawing illustrates the process. The process can be used on old pipelines to restore them to full service and on new pipelines to insure trouble-free operation. The cleaning process employs a combination of mechanical cleaners, solvents, and chemicals. **For more information write or call: Pipecote Service Corp., 3920 South Peoria, Tulsa, Okla.**

•

Otis Selective Collet-Type Packer is illustrated and explained in this two-color, two-page leaflet. Because of the selective nipple feature, several nipples can be installed at various depths in the casing string so that a packer can be set progressively at various depths, or more than one packer can be used. The leaflet illustrates the packer with a labeled cutaway drawing. A critical-dimensions table lists sizes, casing i.d., nipple bore, and largest rock bit o.d. **For more information write or call: Otis Pressure Control, Inc., P. O. Box 7206, Dallas, Tex.**

Texsteam MSM 5001 diaphragm-operated chemical pump

WITH 4 BUILT-IN FEATURES FOR ACCURACY, ECONOMY, EASE OF OPERATION

1. Simplicity of Design—makes repairs by non-technical personnel possible.
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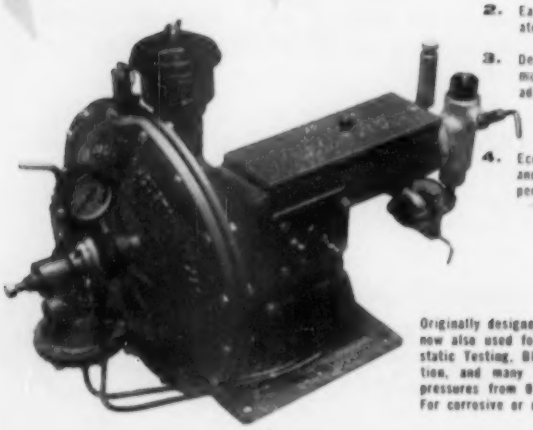

Originally designed for corrosion control work, now also used for Methanol Injection, Hydrostatic Testing, Blending, Evacuation, Dehydration, and many other kinds of work where pressures from 0 to 20,000 psi are required. For corrosive or non-corrosive chemicals.

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320 Hughes St., Houston, Texas

More new National Stores bring total to 129!

Opening day scenes like this have marked the recent and rapid growth of the National Supply Store system. During the first nine months of this year, we opened five new stores, bringing the total number to an all-time high of 129.

One of the new stores is in Citronelle, Alabama—our first in that state. Another, in Venice, Louisiana, meets the needs of many offshore operators. A new store in Cortez, Colorado, is supplying equipment in Utah's Paradox Basin. And two more in Aspermont and Borger, Texas—giving us a total of 32 stores in that state—serve several thousand square miles of active oil country.

Since National Supply began in 1894, we've opened more than 350 stores to serve oil fields in the U.S., Canada and Venezuela. We've also closed many to meet the shifting needs of the fast-moving oil industry. We will continue to open more than we close—and, in line with our policy, each will have complete stocks tailored for the area it serves.

If you haven't stopped in a National Supply Store for a while, you're missing a profitable shopping experience. In a modernized or new National Store, you can quickly see and select the quality equipment, parts and accessories you need. Colorful displays and racks of well-illustrated product literature aid you. And you get the reliable personal service that has helped to make us the world's largest manufacturer and distributor of oilfield machinery and equipment. Stop at the National Store nearest you.

THE
NATIONAL SUPPLY
COMPANY

Even under no loads, fast-falling National Blocks remain stable in operation.

There's a safety-engineered National

You can count on safe, fast block action when you choose from National's complete line of Hook Blocks and Traveling Blocks. Every block is engineered for maximum safety, built for long service and thoroughly field-tested under rugged conditions. As outstanding results of National Supply's long experience in the manufacturing and testing of blocks, you get the quality features listed below:

SPECIAL HOOK FEATURES

- Hook body mounted on tapered roller bearings
- Elevator link supports equipped with positive retaining links
- Automatic-latching hook tongue cannot be accidentally opened
- Spring-actuated 8-position rotation lock
- Grooved hook body facilitates drill pipe alignment with elevator

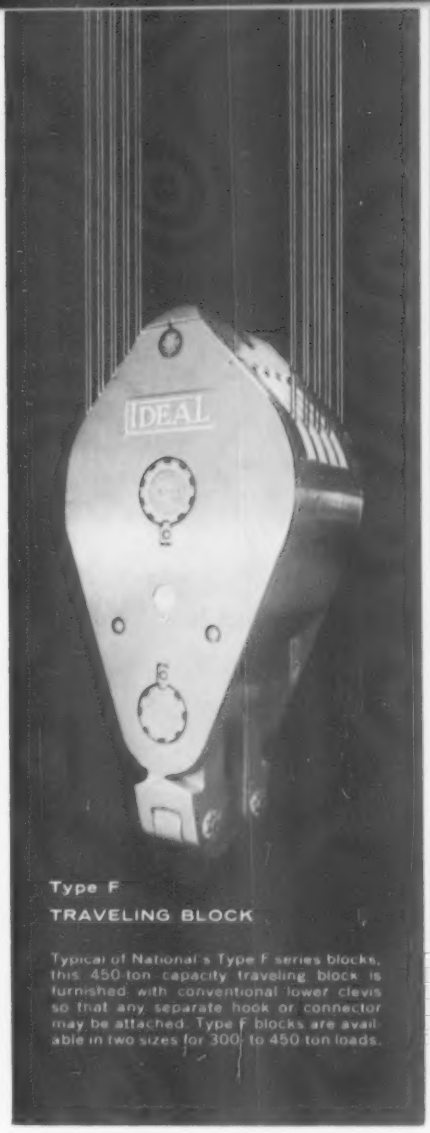
TRAVELING BLOCK FEATURES

- Sheaves independently mounted on tapered roller bearings
- Individual lubrication to each sheave bearing
- All parts securely locked for safety of men working below
- Streamlined—all nuts, bolts, pins and fittings recessed
- Short, low stressed pins and shafts

Your National representative can give you more information about National Hook Blocks, Traveling Blocks and companion Crown Blocks. Ask about the units best suited for your drilling program.

Type E
HOOK BLOCK

Designed for greatest possible saving in vertical derrick space, this 200-ton rated block is typical of the Type E line. Type E blocks are available in three sizes for 90- to 200-ton loads. A complete line of Type E traveling blocks is also available.



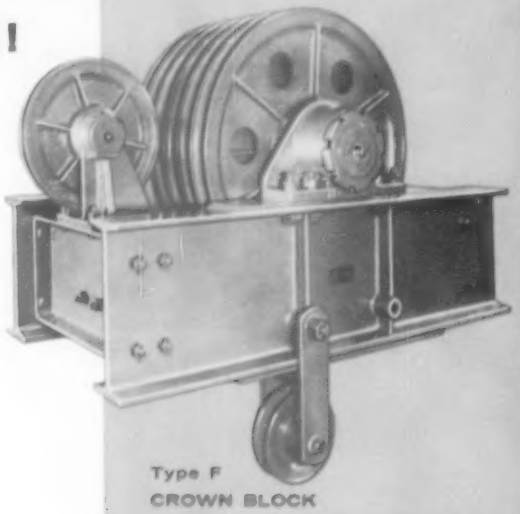
Type F
TRAVELING BLOCK

Typical of National's Type F series blocks, this 450-ton capacity traveling block is furnished with conventional lower clevis so that any separate hook or connector may be attached. Type F blocks are available in two sizes for 300- to 450 ton loads.

Type F
UNIVERSAL HOOK BLOCK

The swivel block "universal" pin joint feature in this heavy-duty, 450-ton rated block distinguishes it from rigidly connected hook and block combinations. Type F Universal Blocks are rated for 300- to 450-ton loads.

Block for every drilling need!



Type F
CROWN BLOCK

Rated at 525 tons, this is the largest of two Type F Crown Blocks available for deep drilling. The smaller unit is rated at 360 tons. Both blocks are of minimum width, have relatively short shafts and a correspondingly high strength to weight ratio. When necessary, they are easily dismantled in the field for installation.

THE
NATIONAL SUPPLY
COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
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CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
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NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

. . . .

and a streamlined National Swivel to help reduce your drilling costs!

Match a compact National Type N Swivel with your National Block and you have a smooth derrick equipment "team" that's tough to beat! Here are the reasons why National Type N Swivels give you continuous service at low operating and maintenance costs:

1. **Reduced weight.** Complete redesigning has been employed to bring every model down to minimum weight in relation to individual rated capacity. The use of high quality, high-strength components throughout has reduced both over-all height and weight to greatly facilitate handling.
2. **Lower center of gravity.** Centerline of the bail pins on Type N Swivels has been raised, thereby lowering center of gravity. This means greater stability in handling, makes connection of swivel "sub" to kelly easier and faster.
3. **Streamlined exterior.** The one-piece steel body is free from any dangerous projections. All bolts, nuts, pins and grease fittings are recessed to assure maximum safety to the derrick crew.
4. **Fast wash pipe replacement.** National's exclusive Uniflex Wash Pipe Box assembly is standard on all Type N Swivels. An improved method for packing off the mud, the Uniflex assembly has quick-acting threads to speed replacement, is easily assembled by one man, can be installed without removing the gooseneck or breaking the hose connection.
5. **Rapid hose coupling.** Also standard on all Type N Swivels is the Quick-Seal Hose Connection that speeds make-up of hose joints. Besides eliminating one hose connection member and therefore minimizing the chance of mud leakage, the Quick-Seal Connection features larger, quick-acting threads and sealing elements to withstand rugged use.

THERE'S A NATIONAL SWIVEL for every job, of course. The six in the Type N Line have comparative dead load ratings from 110 to 500 tons—and depth ranges extending from 2,000 feet to 24,000 feet. Find out soon which one you can best use to reduce your drilling costs. Just ask your National Supply representative for complete details.

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NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

Case Histories of Low Storage-Tank Terminal Losses. Random samples of successful control of terminal losses with expansion roof tanks are presented in this two-color, four-page folder. It presents a table showing locations, atmospheric average temperature, yearly throughput, yearly turnovers, and per cent of loss of throughput for 27 terminals. **For more information write or call Graver Tank & Mfg. Co., Inc., East Chicago, Ind.**

●

Navco Counterpoise Pipe Hangers. Designated Bulletin 156, this new 16-page publication describes counterpoise pipe hangers. It includes complete specifications for a line of hangers, engineering drawings of all models, weight-load selection tables, and erection and adjustment information. Levelglide hangers, which permit horizontal movement of piping systems, also are described. **For more information write or call: National Valve & Manufacturing Co., 3100 Liberty Avenue, Pittsburgh 1, Pa.**

●

Acid Petrofrac, a Combination Acidizing and Fracturing Service, is the subject of a new two-color, four-page folder. It employs photographs and graphs to explain the method of application and the results expected from different treatments in different formations. A page of tables details comparisons of results and of production-decline rates for a representative number of wells fractured and acidized. **For more information write or call: Dowell Incorporated, Tulsa 1, Okla.**

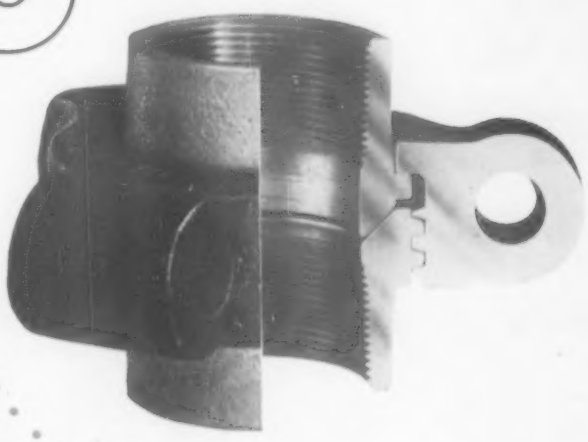
●

Rotary Drilling and Vibrator Hoses for Rotary Drilling Rigs, a 12-page booklet, covers hose construction, couplings, and pressure testing. How to choose hose size and length is discussed. Also presented is the installation, care, and maintenance of rotary-drilling and vibrator hose. Line and cutaway drawings complete the explanations in Booklet IH-1409. **For more information write or call: Gates Rubber Co., 1001 South Broadway, Denver, Colo.**

●

Plastic Pipe and the Paraffin Build-Up Problem is the subject of a new study. The literature covers field tests using Tenite Butyrate plastic pipe in high paraffin areas where ordinary pipe plugged quickly. Engineering reports and case histories give information on the problem and its solution. **For more information write or call: Southwestern Plastic Pipe Co., P. O. Box 117, Mineral Wells, Tex.**

THE 3 MOST IMPORTANT FUNCTIONS OF A UNION



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EASY MAKE-UP AND BREAK-OUT—
LONG LIFE are basically the most important functions of a union. All are synonymous with Weco Unions.

Leak-proof sealing is the result of Weco's ball and cone seat that forms a metal-to-metal surface unequaled for positive sealing. Easy make-up and break-out is provided by Weco's precision machined Acme threads. The long life of Weco Unions comes from sturdier construction of sub ends and wing nuts that can take the toughest treatment a worker can hand them — and come back for more — month after month.

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EQUIPMENT MEN . . . in the News

Drilling & Service Vice President Leaves for Iraq

L. W. Short, vice president in charge of sales, Drilling & Service, Inc., Dallas, left the United States in September for Iraq. He will conduct a special diamond-coring program and train local Middle East personnel in operational techniques of diamond coring for this particular type of area. Short has recently conducted similar programs in South American countries and Canada. The Middle East program is expected to increase the sales and service scope of Drilling & Service.

Nelson to Hold Formal Opening of New Facilities

Formal opening of Nelson Electric Manufacturing Co.'s new million dollar facilities located at Forty-first and Sheridan Road in Tulsa will be held October 19, with an open house for customers and guests from 2 to 5 p.m. All Nelson customers and friends are invited.

The new facilities include a manufacturing plant 400 by 180 ft. The office building contains 22,000 sq. ft. and houses the executive offices, sales, engineering, accounting and cataloging divisions. The lobby is specially designed to accommodate large pieces of Nelson equipment such as switchgear and motor control centers.

Dysart Named Security's South Louisiana Engineer

TED DYSART

The appointment of Ted Dysart as southern Louisiana division engineer has been announced by Security Engineering Division, Dallas-based manufacturer of rock bits and other drilling tools for the petroleum industry. In this new assignment, Dysart will coordinate Security's engineering services to the oil and gas well drilling industry throughout the area from headquarters in Lafayette. According to W. E. Scarborough, chief field engineer, this is another step to give a more intensified service to the petroleum industry in all active regions. Security is one of the Dresser Industries.

Prior to joining Security, Dysart was in Mexico where he served in various engineering capacities with American firms. His most recent assignment was assistant power plant engineer with American Smelting & Refining Co. in Monterey.

A-C Appoints Klein and Voegeli to Sales Posts

W. J. Klein has been appointed vice president and director of sales, and W. L. Voegeli has been appointed general sales manager, Tractor Group, Allis-Chalmers Manufacturing Co., Milwaukee, Wis. The three divisions of the Tractor Group are farm equipment, construction machinery, and Buda which manufactures engines and material-handling equipment.

W. J. KLEIN

W. L. VOEGELI

Klein has been vice president and general sales manager, Tractor Group, while Voegeli has been assistant director of engineering. Klein became affiliated with Allis-Chalmers in 1928. Voegeli started with the company at the Wichita branch as a serviceman in 1935.

Mayfield Added to Dewey Supply Tulsa Sales Staff

A. V. Mayfield, former purchasing agent for Dewey Supply Co., has been added by the firm to its city sales force in the Tulsa area. Mayfield was employed by Mid-Continent Supply Co. in Oklahoma City and Union Supply Co. in Hobbs, N. M., before joining Dewey Supply in 1955.

Dewey Supply Co., with main offices in Tulsa, has sales offices in Tulsa, Bartlesville, and Oklahoma City. Four main outlets are located in Ada, Dewey, Chickasha, and Okemah, Okla.

Western Supply Appoints Alaback as Sales Engineer

L. A. ALABACK

The appointment of Lloyd A. Alaback as sales engineer has been announced by J. E. Hughes, vice president of Western Supply Co., Tulsa. Alaback's specific duties with Western will be the sale of Brown-Fintube heat-transfer equipment consisting of Brownwald Fintubes, longitudinal fin double-pipe exchangers, tank heaters, tank suction heaters, line heaters, and fired indirect heaters. His territory will include Kansas, Oklahoma, and western Missouri.

Walworth Acquires Grove Companies

Walworth Co. has contracted to acquire all the outstanding capital stock of Grove Valve & Regulator Co. and Grove Controls, Inc., both of Oakland, Calif., Fred W. Belz, Walworth president, has announced.

The Grove companies have been leaders in new designs and developments in controls and ultrahigh-pressure regulators for the gas and oil-producing business, and the chemical and petrochemical industries.

In recent years, Grove Valve & Regulator Co. has pioneered the devlopment of giant fabricated steel gate valves for the natural-gas and oil-transmission industries.

The Grove companies operate in a modern plant having 126,000 sq. ft. of floor space. In addition, Grove recently has constructed a new plant with 74,000 sq. ft. of space in Longview, Tex. The Longview plant will be made available for Walworth and its subsidiaries to manufacture products for the petrochemical, oil and natural-gas markets in the Southwest.

Other subsidiaries of Walworth which have been acquired since July 1955 are: Conoflow Corp. of Philadelphia; Southwest Fabricating & Welding of Houston; Alloy Steel Products Co. of Linden, N. J.; and M. & H. Valve & Fittings Co. of Anniston, Ala. Walworth plants are located in Boston, Mass., Greensburg, Pa., Mineola, Long Island, N. Y., East St. Louis, and Kewanee, Ill.

Exploration Techniques Is Organized in Houston

Exploration Techniques, Inc., a new service to the oil industry, has been formed in Houston, it has been announced by the firm's president, Jonathan W. Phillips. The company will offer an analog computing service for gravity analysis in all fields of oil, gas and minerals.

Serving as a part-time exploration department for independent oil operators and small oil and mineral companies, the new firm also is employed on a consulting basis by major oil companies.

The organizers of Exploration Techniques, Inc., assisted in the development of the gravity anomaly simulator which is a highly accurate method of analyzing anomaly profiles taken from Bouguer maps.

Active with Phillips in the newly organized company is Lynn W. Brasher. Both are geophysicists with extensive experience in the oil industry.

Exploration is temporarily located on Stillbrook Drive pending completion of its own office building now in the planning stage.

Win-Well Appoints Arduser And Specialty Sales

The appointment of Arduser & Co., Tulsa, and Specialty Sales & Service, Inc., Odessa, Tex., as sales representatives for Win-Well Manufacturing Co. of Los Angeles has been announced by William B. Pollock, Win-Well president. Win-Well recently introduced the Win-Well seven-way multiport selector valve, designed for the control of bulk liquid flow, which enables oil producers to make radical changes in testing, metering and sampling.

H. W. ARDUSER

M. L. WALRAVEN

Arduser & Co., headed by H. W. Arduser, will handle sales in the Oklahoma territory for Win-Well. Arduser has had wide experience in the oil industry, working chiefly with the application of automatic-control specialties.

Specialty Sales & Service will handle the Dallas, Fort Worth, and West Texas sales area for Win-Well, with headquarters in its Odessa branch, managed by H. W. Wood. President of Specialty Sales & Service is M. L. Walraven, Tulsa, known in the petroleum industry for introducing the Dempsey hydraulic pump and for his activities as an independent oil producer.

Nomads' Past Presidents Attend Los Angeles Meeting

Eleven past presidents of Nomads were present at a recent meeting of the Los Angeles chapter of Nomads, 10 of the Los Angeles chapter and one of the New York chapter. They are (seated): Joe Schlarb of Emsco Manufacturing Co.; Bill Bettis of Johnston Testers; Harry Hester of McCullough Tool Co. (present president); John Flanagan of Johnston Testers; Bill Wilson of Web Wilson Oil Tools. Standing: Russ McIntire of Baker Oil Tools, New York; Henry Pullman of Baker Oil Tools; Ernie Fowks of Emsco Manufacturing Co.; Lee Laird of Laird Equipment & Sales Co.

Not shown: Elmer Smith, export representative; Bob Eiche of R. J. Eiche & Associates; Fred Ripley of Oil Well Heating Systems.

BJ Service Expands Bulk Plant at Odessa

BJ Service, Inc. has added new storage and blending facilities to its bulk plant at Odessa, Tex., according to W. T. Box, vice president in charge of operations for BJ Service, Inc. These additional storage silos increase the capacity for storage by 40 per cent. The new blending facilities provide for the accurate blending of cement and admixes of all types.

J & L Supply Names Four As Sales Representatives

The recent appointment of John P. Gregor as sales representative, drilling equipment; naming of T. G. Row and P. J. Fischer, Jr., as sales representatives at Rangely, Colo., and St. Elmo, Ill., respectively; and promotion of Clifford G. Gardner to the position of sales representative in the North Texas district have been announced by W. L. Wolfe, vice president of sales of Jones & Laughlin Supply Division, Tulsa.

Gregor, who will be headquartered in Houston, will promote the sale of drilling equipment in the Texas and Louisiana Gulf Coast districts. Row, formerly manager of the J&L supply store at Rangely since 1953, has served as storeman, field salesman and local store manager at various points in the south and north Rocky Mountain districts.

Fischer joined J&L's Wichita Falls, Tex., store force in 1952 and remained there until his transfer to the Sherman, Tex., store in 1955. Prior to his assignment, he had served as a sales representative in the Sherman area since October 1955.

Gardner, formerly a storeman at the firm's oil-field-supply store in Winfield, Kans., will have headquarters in Graham, Tex. He joined J&L in 1953 as a storeman at Casper, Wyo., and in 1954 was transferred to Winfield.

Sammis, Hill Named to Tex-Tube Sales Posts

W. A. (Bill) Sammis, Jr., has been named South Texas district manager for Tex-Tube, Inc., of Houston, and Joe S. Hill has joined the Houston sales staff.

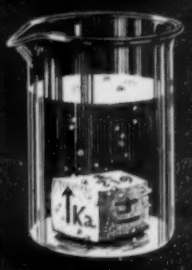
W. A. SAMMIS, JR.

Sammis is opening a district sales office for Tex-Tube in New Moore Building in San Antonio. The office will be in operation by November 1. Sammis was with Sheffield Steel Corp. 5 years and with Youngstown Sheet & Tube Co. 6 years.

Hill was formerly employed by Longhorn Machine Works for 8 years as a sales representative in Louisiana.

Tex-Tube is one of the largest independent industrial pipe distributors in the Southwest.

today's special . . .



INFORMATION ON THE ROCKS

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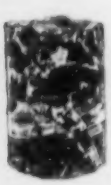

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Cardium Concept Due for Overhauling

by Frank J. Gardner

FOR a sand that had never before been known as a host rock for oil, Alberta's Cardium - Upper Cretaceous has done all right for itself. In only 3 years it has emerged as Canada's greatest commercial reserve rock, with conservative estimates of 2 billion barrels of recoverable oil.

A new reservoir . . . Prior to June 1953, the Cardium was known only from its outcropping on the south flank of the Peace River arch in western Alberta. A couple of wildcats in the foothills belt had found showings of Cardium gas, but it had never been seriously considered as an oil reservoir.

Then came Pembina. This sprawling giant, now Canada's largest field, was the first ever to produce Cardium oil; the discovery well, Socony-Seaboard 1 Pembina, was finished on July 1, 1953. Today there are 1,454 wells on production over a field area of 350,000 acres, and they're producing nearly 110,000 bbl. daily.

Following Pembina, a chain of Cardium pools was uncovered along a northwest-southeast trend. These were Rocky Mountain House, Garrington, Peers, Leslieville, and Alhambra. All indications were that the eastern edges of this chain of fields represented the eastern pinchout limit of the effective Cardium sand, and such porosity pinchout lines began to appear on nearly every map of Alberta (see dotted line on map).

Pops up in new places . . . Then, in 1955, new things happened. Cardium production was discovered at points far to the east of the postulated pinchout zone. At Bonnie Glen field, The Texas Co. announced completion of its Pigeon Lake 11-26 well as a 71-bbl. per day Cardium oiler. On the west side of Leduc field, Bay Petroleums et al made a gas discovery in the Cardium; this well, the Cuba Harish 3, topped Cardium at 2,980 ft. and completed for 3 million cubic feet per day, with slight naphtha spray. Then, 10 miles west of Leduc, Texaco again made a Cardium discovery at its Holburn A-10-33; this one was a gas well, producing from 3,280-85 ft. and has been shut in since discovery. This discovery trio served notice to the industry that the Cardium concept was in for drastic revision, for it held reservoir possibilities much farther east than anyone had thought.

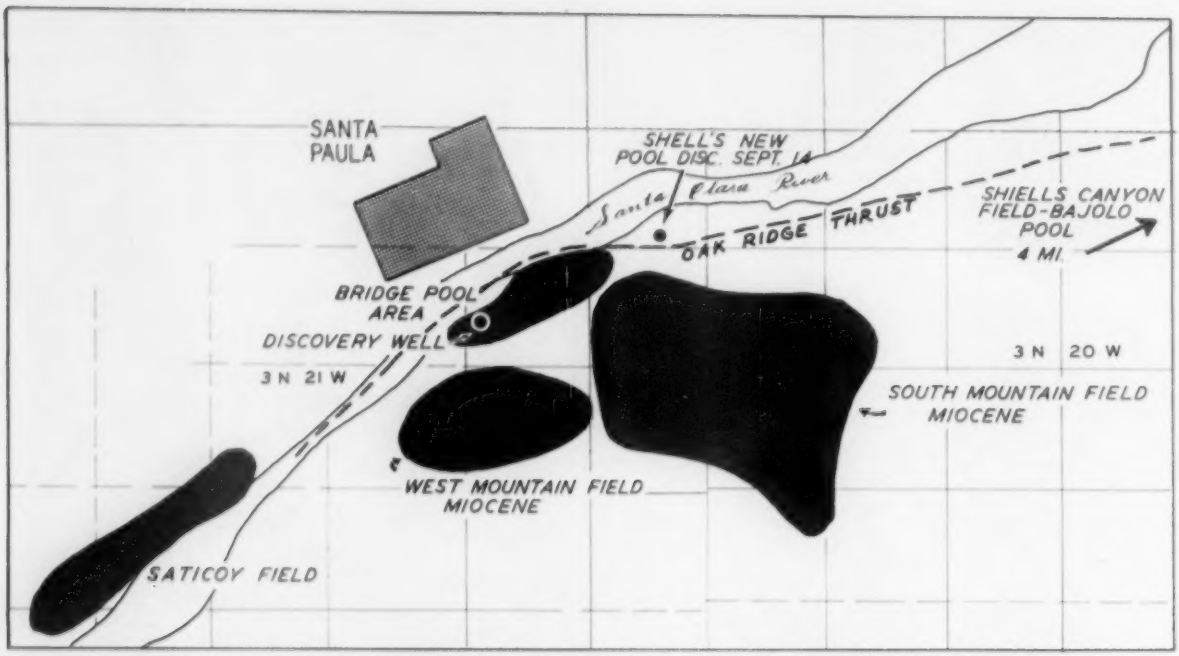
In 3 years the Cardium sand has emerged as western Canada's greatest commercial oil reservoir. New Cardium strikes far to the east of previously postulated pinchout limits are forcing a new look at the sand.

But 1956 has brought on a real series of clinchers. Events of the past 2 months have indicated even greater stretches of Cardium productivity to the south and far southeast *(see The Oil and Gas Journal, September 17, page 367)*. These were the discoveries by Shell Oil Co. at its A-13-2 Crossfield, only 18 miles north of Calgary, and by Scurry-Rainbow Oil, Ltd., at its 1 Medicine Hat, 250 miles southeast of Pembina field and only about 50 miles west of the Saskatchewan border.

Now, Canada Cities Service Petroleum Corp. has dropped a real blockbuster with its two discovery wells at Keystone (center of map). Both have been high-potential natural-flow wells from shallower depth (4,300 ft.) than Pembina. In Pembina, nearly every completion involves fracture treatment to increase initial flow. Not so at Keystone. The first well, Cities Service 8-15 Keystone, went on production on July 13. Cities Service has never revealed a potential on it, but the second well, 1½ miles northwest of the discovery, made 592 bbl. natural through a 30/64-in. choke, to mark it as one of the best Cardium wells on the books.

Pointing up the erratic nature of Cardium sand is a key wildcat now drilling 6 miles east of Keystone. Here, at Cree Oil of Canada, Ltd., 7-10A Warburg, a small show of oil in the Cardium was all that appeared; other showings, however, indicate an important discovery at Warburg. Operators have reported commercial gas flows from the basal Belly River at 3,125-60 ft., the Viking sand at 4,927-75 ft., as well as oil recovery from Mississippian at 5,734-82 ft. Another multiple-pay discovery is in the making at Warburg, but the Cardium has proved disappointing.

And changes a concept . . . These events all deepen the shadows shrouding our subsurface picture of the Cardium in Canada. Stratigraphers there have a job ahead of them. The original concept of the Cardium sea must be completely revised in the light of these unexpected discoveries in spots where the Cardium supposedly was not.



ONE OF CALIFORNIA'S MOST PROLIFIC NEW-DISCOVERY AREAS in years is the Bridge area of South Mountain in Ventura County.

Oakridge Fault Gives Up Pliocene Production

. . . Ventura County, California, is pay area

by William T. Smith
District Editor

RECENT successes in drilling for Pliocene production associated with the Oakridge thrust fault in Ventura County points up this area as one of the most prolific discovery areas turned up in California in years.

Harry C. Long's Basolo pool discovery in Shiells Canyon field in 1952 gave operators their first indication that the entire string of anticlines associated with the Oakridge fault might be valuable sources of Pliocene production. Prior to Long's find, all crude produced from Oakridge fault anticline fields was from Lower Miocene-Oligocene-Eocene nonmarine Sespe sands on top of the sharply overturned fault.

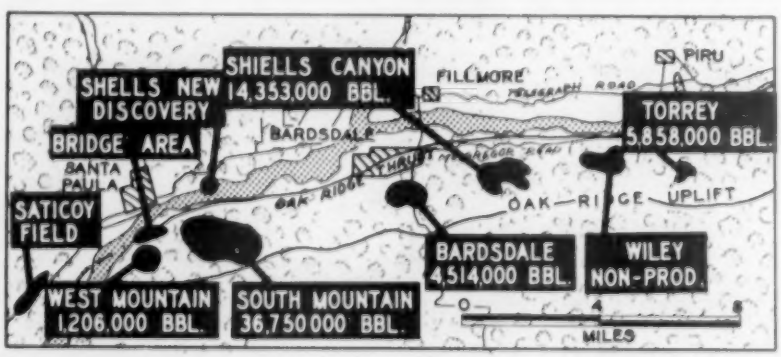
Since that time, four other Pliocene pools, one at Saticoy, two at Bridge area, and one at Bardsdale also have turned up. Saticoy field is 4 miles southwest of the town of Santa Paula, Bridge area is just across the river east of Santa Paula and Bardsdale is 8 miles of Santa Paula, and Bardsdale is 8 miles

There are a number of other locations along the Oakridge fault, which roughly parallel the Santa Clara River for about 20 miles, where conditions exist similar to those at Bridge area, Saticoy field, Bardsdale, and Basolo pools.

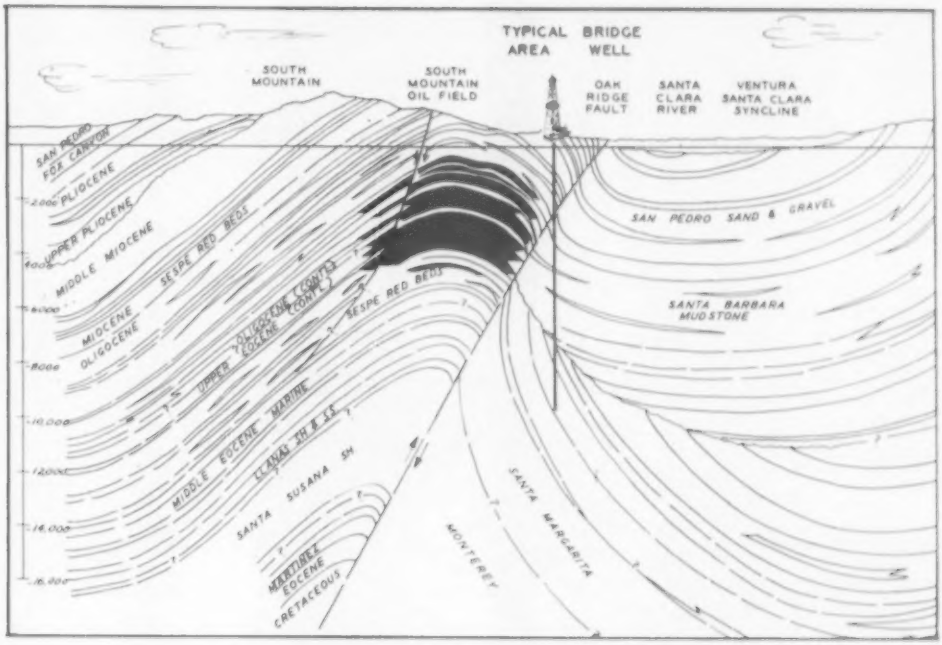
The Oakridge fault trend includes six anticlines, five of which are productive. From east to west they are the Torrey, Wiley, Shiells, Bardsdale, and South Mountain. Only the Wiley, the lowest structurally of the six, is nonproductive.

Sespe production found above the Oakridge fault has been known since 1894 when Bardsdale field was discovered. Next came Torrey Canyon in 1896, Shiells Canyon in 1911, South Mountain in 1916, and fairly recent West Mountain field in 1945.

A unique feature of the Saticoy-Bridge-Bardsdale-Basolo development is that operators are finding Pliocene production below Oligocene, Miocene, and Eocene production. This upside-down condition results from drilling through or below the Oakridge fault where the dips on the outer rim of the north flank are steeply overturned. Pliocene pools



HERE IS THE STRING OF ANTICLINAL FIELDS associated with Oakridge uplift (after A.A.P.G. Guidebook, March 1952).



SCHEMATIC CROSS-SECTION illustrates the effect of the Oakridge fault at South Mountain field. The typical Bridge area well illustrates how wells are drilled from older formations on top of the fault to younger ones far below the fault.

are formed where sands are closed up against the fault on the underside.

The Pliocene pay at Saticoy, Bridge, Bardsdale, and Basolo also correlates with the producing interval in huge Ventura Avenue field, 15 miles west of the Bridge area.

While any comments on the eventual productive limits of this area are highly speculative at this point, clues are present which indicate a trend of pools possibly extending the entire length of the Oakridge uplift string of anticlines.

Emphasizing this possibility are the two newest discoveries, one by Shell Oil Co. and the other by Union Oil Co.

Shell's wildcat, 1 Shell Universal-Consolidated Harvey, tapped a Santa Barbara zone Pliocene pool about 1 mile east of the Bridge area. The discovery is about 1,000 ft. north of Sespe producing wells in old South Mountain field. From an original vertical total depth of 11,688 ft. it was directionally redrilled twice before reaching its completion total depth of 8,290 ft.

It was dually completed in zones at 7,070-7,535 ft. and 7,667-8,128 ft. The lower zone was put on production flowing 460 bbl. daily of 30°-gravity crude. The upper zone was cemented and perforated preparatory to being put on production as soon as final plans were completed.

The Union discovery at Bardsdale field is almost 8 miles east of the Bridge area and gives the Oakridge fault a string of Pliocene pools almost 12 miles long. This wildcat, 1 Irwin-Berylwood, came in flowing 650 bbl. daily of 32.3°-gravity crude from selectively perforated intervals between 6,100 and 6,350 ft. The drill site is on the west flank of the Bardsdale field.

Hottest area . . . Southeast of Shell's find and just across the river from the town of Santa Paula, the Bridge area is being labeled the hottest find in California in recent years.

The Texas Co., as operator for itself and Union Oil Co., hit the Bridge area pool discovery the day before Christmas last year with 1 Richardson Earl. This wildcat, like subsequent development wells in the area, was drilled through the Oakridge fault. It was completed in the Pliocene Pico formation at 7,211-7,720 ft. for 153 bbl. daily of 33.6°-gravity crude.

The Bridge area discovery well is located about a half mile west of South Mountain field where wells are producing from Miocene Sespe sands at an average depth of only 4,467 ft.

The discovery well had a rapid production decline the first week and was finally put on pump. After yielding about 30 bbl. daily on the pump for a short period, production started tailing off again. Texaco then sand fractured the producing interval and recompleted the discovery flowing 91 bbl. daily.

Development . . . It wasn't until the second well was completed in the Bridge area that its full potential began to be suspected. For this first extension, Texaco moved 500 ft. northeast and drilled 2 Richardson Earl. It was completed in May 1956, in two zones at 6,338-7,016 ft. and 7,375-8,050 ft. flowing 925 bbl. of 31.5°-gravity crude daily through a 24/64-in. choke.

Texaco then moved the limits of the field 550 ft. northeast of the discovery with 2 Hyde Pinkerton. It was completed flowing 891 bbl. daily from 1,000 ft. of zone at three intervals between 6,497 and 8,100 ft.

At this point Texaco went back into the discovery well for the fourth time. It was deepened to 9,002 ft. and recompleted between 7,717-8,188 ft. flowing 606 bbl. daily of 33.6°-gravity crude.

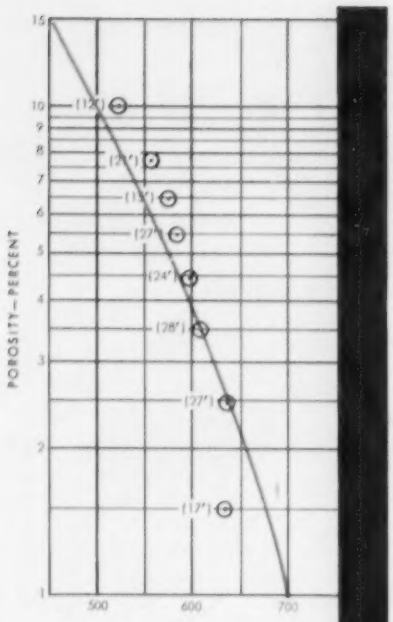
The most westerly well is Shell's 1 Saticoy which was completed August 6 about 1,500 ft. west of the discovery. It made 503 bbl. daily of 33.6°-gravity crude from two zones between 6,267-6,665 ft. The eastern limits now reach 3,200 ft. from the discovery where 1 Richardson ranch was completed August 8. The most northerly producer is B-1 Yale Richardson located 1,000 ft. northeast of the discovery. This well flowed 1,131 bbl. daily when completed August 7. It has 1,700 ft. of zone open, the thickest of any well in the pay so far.

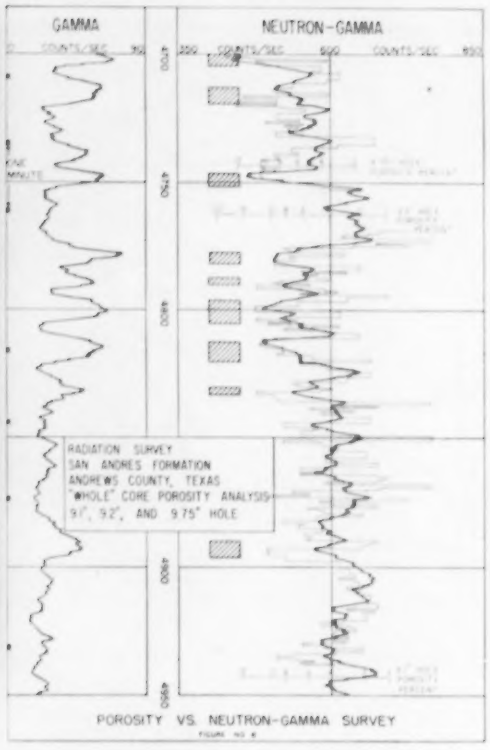
The Bridge area now has seven producers flowing an average of 600 bbl. each daily under severely restrictive chokes.

Shell's wells are on the west flank of the field while Texaco is drilling west and south of the discovery well on a stepout program. The Bridge area will probably be developed on a 10-acre-spacing program within the limits of lease obligations.

Saticoy field . . . Saticoy field, 4 miles southwest of Santa Paula and the Bridge area, was found last year by the slant-drilled Shell 2 S.P.S. in NE

A COMPARISON OF THE NEUTRON COUNTING RATE VS POROSITY ENCOUNTERED IN THE SAN ANDRES FORMATION ANDREWS CO., TEXAS WITH TEST HOLE DATA.
(') NO. OF FEET AVERAGED TO OBTAIN TO THE POINT SHOWN.
⊙ FROM FIELD WELL
FROM TEST WELLS
SECTION 4769'-4998'
HOLE DIAMETER—9.1"
169' CORE DATA PLOTTED





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The data graphed here dramatize the results of a recent Halliburton improvement in method of giving customers accurate porosity information on wells in clean limestone... using high-precision radioactivity surveys. The red curve on log paper was obtained by Halliburton laboratory research on simulated wells in blocks of limestone of known porosity. The circled points were obtained from a San Andres well zone in Andrews County, Texas, as illustrated by the radioactivity log also shown here, overlaid by precise "whole core" porosity determinations in red. See for yourself how close Halliburton logging came to "laying porosity on the line".

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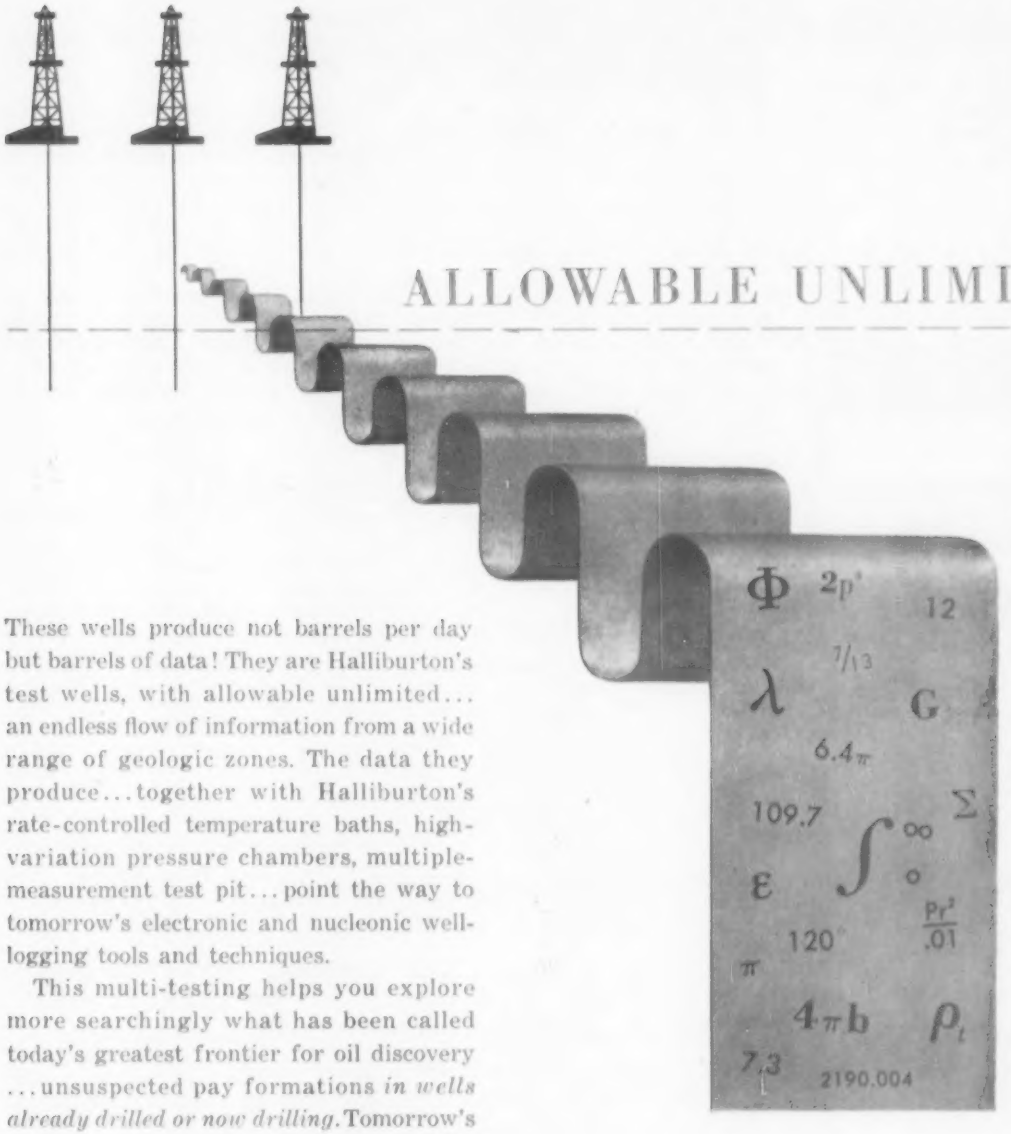

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SW 29-3n-21w. It was completed as a new-field discovery producing 286 bbl. daily of 32.3°-gravity crude through a 14/64-in. choke. The interval here is 7,425-7,775 ft. which is in the Pico Pliocene formation as are the Bridge area wells.

Twelve wells are currently on production at Saticoy with rates ranging between 100 and 300 bbl. daily. As at the Bridge area, these wells are producing under severe choke restrictions. Some were completed at rates as high as 900 bbl. daily. Typical of these wells is Shell 3 Edward which was brought in August 21, flowing from two zones between 6,046-6,664 ft. on the extreme south flank of the field. The upper zone flowed 381 bbl. daily and the lower 445 bbl., both under chokes of from ¼ to 14/64-in.

Future . . . Operators do not predict one big long field stretching the 12 miles from Saticoy to Basolo. They see a series of pools between them as operators try to extend production in known pools. The area is highly faulted and requires involved geological study.

Efforts to connect Saticoy with the Bridge area hit a snag in May when Shell abandoned a 10,871-ft. test as a dry hole about a half mile northeast of Saticoy field on a direct line between Saticoy and Bridge area.

EXPLORATION HIGHLIGHTS

APPALACHIAN

WEST VIRGINIA

In Licking district, Tucker County, West Virginia, Hope Natural Gas Co. et al., completed deepening No. 9854 William Blair, wildcat, elevation 1,816 ft., in the Oriskany sand. The top was 4,761 ft., and was first completed at 4,866 ft. The second gas pay was at 4,872-4,875 ft., gaging 1,400,000 cu. ft., after fracture, TD 5,019 ft.

- Pleasants district, Barbour County, Godfrey L. Cabot, Inc., 1-1440 Naomi Vickers, elevation 1,836 ft., was dry, TD 7,627 ft.
- Beaver district, Nicholas County, Columbian Carbon Co., located 1250 The Gauley Co., elevation 2,992 ft., Cowen Quadrangle, 4.80 miles south of latitude 38 degrees 20 minutes, 3.45 miles west of longitude 80 degrees 30 minutes.

Dry Fork district, Randolph County, West Virginia, Nelson W. Taylor, Agent 1 H. R. Tingler, deep test shut down at 6,276 ft. The Oriskany sand was topped at 6,051 ft., and recorded gas shows at 6,114, 6,185 and 6,190 ft. Hope Natural Gas Co. 10000 U.S.A. Department of Interior is at 4,717 ft.

- Allen district, Morgan County, Transcontinental Production Co. 1 Amasa Nestor is drilling at 3,586 ft., in the Oriskany sand.

OHIO

A 1½-mile east extension to a small pool in Union Township, Knox County, was brought in by W. H. Bears on 1

Exploration this week

Appalachian	190
Hugoton Embayment	191
Ark.-La.-Tex.	193
Mid-Continent	198
Western Canada	201
Rocky Mountain	202
Pacific Coast	203
Basin and Range	204
Great Lakes	204
West Texas-New Mexico	206
South Texas	207
South Louisiana	208
Successful Wildcats	209
Exploration Geophysicists 26th Annual Meeting Schedule	210

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L. R. Blubaugh, Section 6, Tiverton Township, Coshocton County. Clinton sand at 2,848-82 gaged 60 bbl. in a 24-hour test after fracture.

● In the south part of Flint Ridge field Cannon Oil 1 Emmett Shuey, Section 10, Hopewell Township, Licking County, gaged 300 bbl. in 24 hours after fracture. Clinton sand was found at 3,087-3,130 ft.

● Preston Oil 2 R. S. Mickley, Lot 7, Howard Township, Knox County, a ¼-mile south extension made 225 bbl. in a 24-hour period after fracture from Clinton at 2,624-74 ft.

PENNSYLVANIA

In Young Township, Indiana County, Southwest Pennsylvania, two new wildcat locations have been started in the vicinity of the large one completed by the Manufacturers Light & Heat Co., on the Stewart and R. & P. Coal Co., lease. One is by this company on the same lands and the other is by New York State Natural Gas Corp. N-514 Florence Bodin. Both are on the Elders Ridge Quadrangle, the Coal Co., being 1.10 miles south of latitude 40 degrees 35 minutes and 2.93 miles west of longitude 79 degrees 15 minutes, and the Bodin being 1.40 miles south and 2.40 miles west.

● Gaskill Township, Jefferson County, Columbian Carbon Co. 1835 Frank M. Sheesley, shut down at 7,551 ft., to fracture. The top of the Oriskany sand was 7,518 ft.

HUGOTON EMBAYMENT

SOUTHWEST KANSAS

Ford County Has Indicated Discovery

Casing is set at a new discovery well in eastern Ford County. Pure Oil Co. and Ohio Oil Co. 1 Anna Konda, C NW SW 11-27s-22w, 4 miles north of Pleasant Valley pool and 12 miles east of Dodge City, recovered 280 ft. of free oil, 270 ft. gassy oil-cut mud, 10 ft. of mud and 120 ft. of muddy, very heavily oil-cut salt water on a drill-stem test in the Mississippian at 4,970-5,047 ft. Another test at 5,050-97 ft. recovered 30 ft. muddy oil.

Morton Gas Discovery Completed by Panhandle

Panhandle Eastern Pipeline Co. completed the 1-7 Wacker wildcat in C SE 7-34-41, 3 miles northeast of Taloga pool and 2½ miles northwest of Wilberton in Morton County, extreme southwestern Kansas.

The gas discovery flowed 24,225 M.c.f. of gas per day from perforations at 3,017-3,272 ft. in the Topeka.

NORTHWEST OKLAHOMA

Hoover Gas Flow Increases at Laverne Well

An extension well in the Laverne district being drilled by Gulf Oil Corp. increased its gas flow from the Hoover sand.

The 1 Dunsworth, SW NE 27-26n-25w, flowed an estimated 3,500 M.c.f. of gas per day from the Hoover sand at 4,188-4,215 ft. It then increased to 4,490 M.c.f. per day. The latest test at the well flowed 7,500 M.c.f. per day on ¾-in. choke. Gulf will complete the well.

OKLAHOMA PANHANDLE

Big Wells Completed At Northwest Hardesty

Recently opened Northwest Hardesty field in Texas County gained two prolific gas wells last week. Panhandle Eastern Pipe Line Co. 1 Graham, C SE NW 30-3n-18eCM, flowed 88,399 M.c.f. of gas per day from the Morrow-Pennsylvanian sand at 6,232-51 and 6,281-93 ft. The 2 Miller in C

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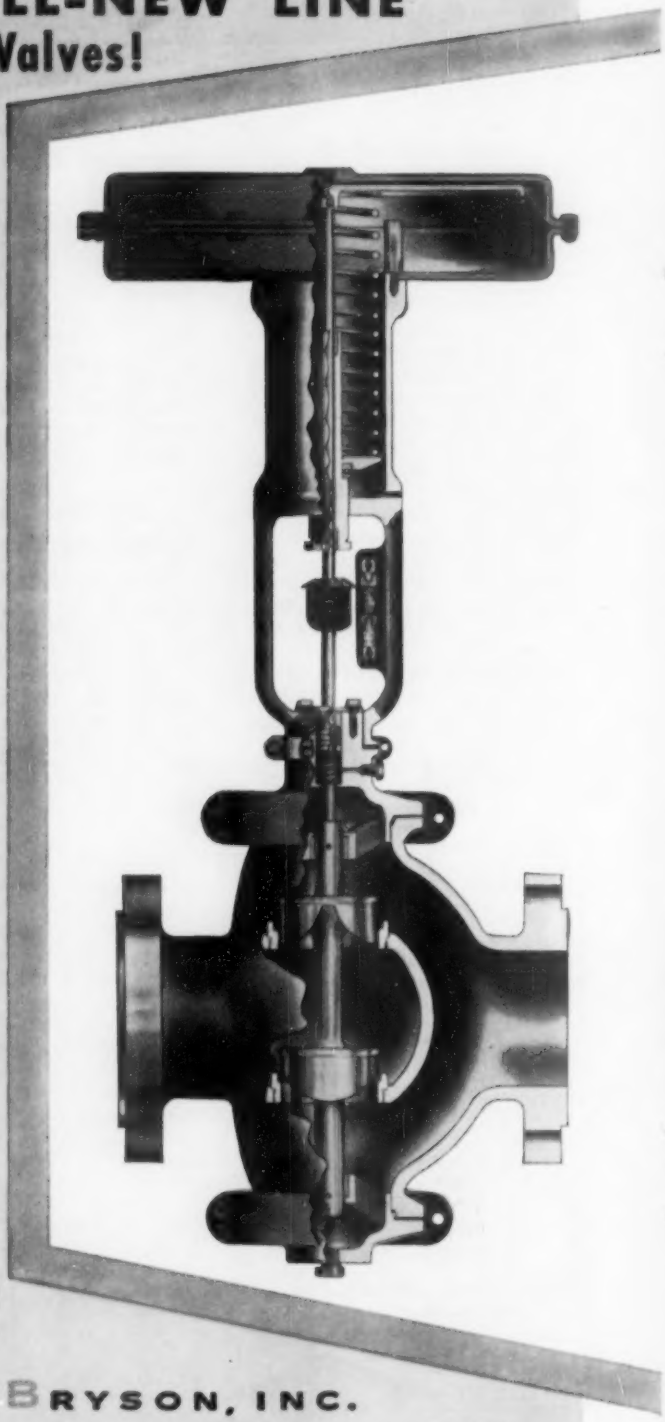

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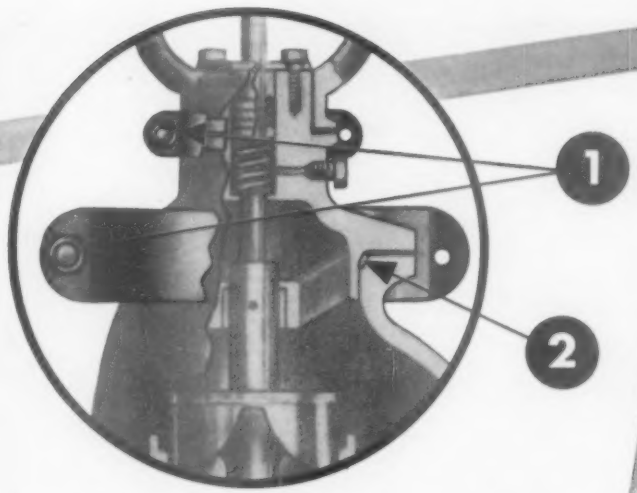

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NW SE 13-3n-17eCM was completed flowing 19,920 M.c.f. per day from perforations at 6,206-34 ft., also in the Morrow.

It was at Northwest Hardesty field that Panhandle got its prolific oil flow from the Morrow several weeks ago at the 2 Ballew well. That discovery flowed up to 1,000 bbl. of oil per day plus large amounts of gas.

Testing Under Way at New Beaver Discovery

Cabot Carbon Corp. 1 Ryser, C NE SW 9-3n-28eCM, Beaver County, is a new Chester gas discovery. The Mississippian success flowed 2,810 M.c.f. of gas per day on test of the zone 7,318-33 ft. Cabot now will test the Hoover sand at 4,450-83 ft.

TEXAS PANHANDLE

Upper Morrow Wildcat Pumps Morrow Oil

An upper Morrow sand (Pennsylvanian) oil discovery was completed in Ochiltree County pumping 212 bbl. of 37°-gravity oil per day from perforations at 8,773-78 ft. The discovery is Rip C. Underwood and Parker Petroleum, Inc. 1 Johnson, 20 miles southwest of Perryton in the southwest part of the county, 1 mile east of Harbaugh field.

ARK-LA-TEX

NORTH LOUISIANA

New Wilcox Field Opened in Concordia

Normandy field, a new Wilcox oil producing area in east-central Louisiana, was officially opened. The discovery well is William G. Helis 1 Normandy Plantation, 1¼ miles northeast of Security.

The well flowed 85 bbl. of oil per day on ⅛-in. choke from perforations at 5,017-20 ft. in the upper part of the Burrill sand of the Wilcox zone.

ARKANSAS

Rodessa Gas Flows At Lewisville Well

A well on the north edge of old Lewisville field, north-central Lafayette County, flowed gas at the rate of 1,500 M.c.f. per day on ¼-in. choke from perforations in the Gloyd zone of the Rodessa at 3,489-91 ft. The well is David Crow, Trustee 1 Austin Ward estate in SE SW 13-16s-24w, 1½ miles east of Lewisville.

A New Zealand Railway's publicity photograph showing a steam locomotive, fired by BP heavy furnace oil.

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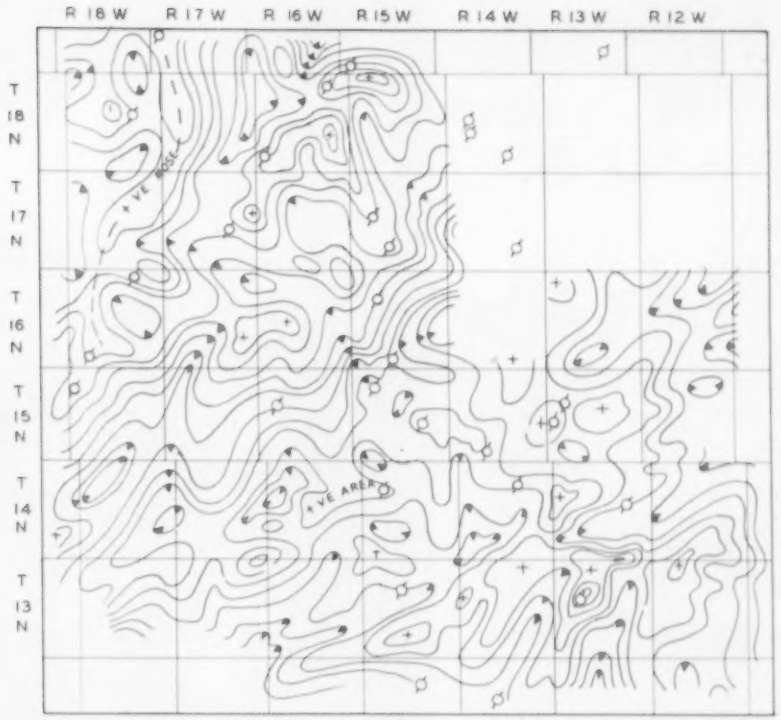

PORTION OF THE SEISMIC MAP of Saskatchewan. Highs are indicated by plus signs, arrows point in the direction of dip. Dry holes are shown by a circle with a line drawn through it. Area mapped lies west of the third meridian.

South Saskatchewan Seismic Map Reveals Regional Trends

by Henry B. Sawatzky

THIS map has been compiled from seismic data submitted to Department of Mineral Resources, Saskatchewan, by the various Crown permit holders in compliance with the regulations under the Mineral Resources Act. The information presented has now attained nonconfidential status and falls in an area of the province south of Township 35. Original scale of map is 1 in. to 8 miles. In addition to the contours, the map indicates the locations of exploratory wells drilled prior to April 1954, with the exception of some of the discovery wells. Recent well locations have been omitted because of the time lapse involved in processing the seismic data.

Author is geophysicist, department of mineral resources, Province of Saskatchewan, Canada.

The main purpose of the map is to illustrate the regional tectonic pattern of southern Saskatchewan, and, at the same time, reveal some of the localized structural trends. It is hoped this map will supplement geological mapping and interpretation in areas where well control is scanty and that it might be used as a general guide in selecting and planning future exploratory programs. It also affords the opportunity to compare and merge local seismic control which an operator may have, with the more widespread regional control given here.

In preparing for this project, several major problems became apparent:

1. The lack of continuous control for a particular reflecting horizon would create unbridged gaps on the map.

2. Some of the source material was submitted in the form of two-way corrected time and the remainder in subsea depths in feet.

3. Variations in the choice of datum planes also prevailed.

The original data submitted for any given horizon might have been reduced to a common base pending additional information and staff. With the exception of a few instances, this procedure was discontinued, in view of the difficulty posed by (1).

Relief Map Compiled

The only reasonable avenue of approach that could be pursued, was to compile a relative relief map based on the most reliable data available in a given area and merge the resultant picture with the control from adjoining areas without labeling contours in regard to absolute values in time or depth.

To maintain maximum continuity, reflection horizons near the top of the Paleozoic surface were used extensively; however, information from Jurassic and Lower Cretaceous formations was resorted to in certain cases. Although unconformities do exist between some of the horizons mapped, the regional dip and structural trends are similar. Due to the scale of the map, no attempt has been made to differentiate between the various types of control employed. Maximum uniformity in contour intervals was arrived at by using a 0.010-second interval where the source material was represented in two-way corrected time; a 50-ft. contour interval was chosen in regions where the information was based on subsea depths in feet. Structural highs have been designated with a plus (+) sign. The direction of dip is indicated by means of the arrowheads attached to the contour lines.

Future publications . . . The department intends to publish revised editions of this map and a similar sheet for northern Saskatchewan, as additional information becomes available in areas where no coverage is shown at present, or where more detailed control sufficiently alters previous interpretations to warrant revision.

Editor's note . . . Saskatchewan is one of the most active areas in Canada, taking a backseat only to Pembina, Canada's largest oil field. Most of the drilling and exploration activity is centered in the southeastern part of the province. Here oil companies are rapidly developing oil reserves in the Mississippian limestone at drilling depths of 4,500-5,000 ft. The wildcat success ratio in this part of Saskatchewan has been abnormally high; in August, eight successful wildcats were completed and only 24 dry holes for a record of 1 in 4.

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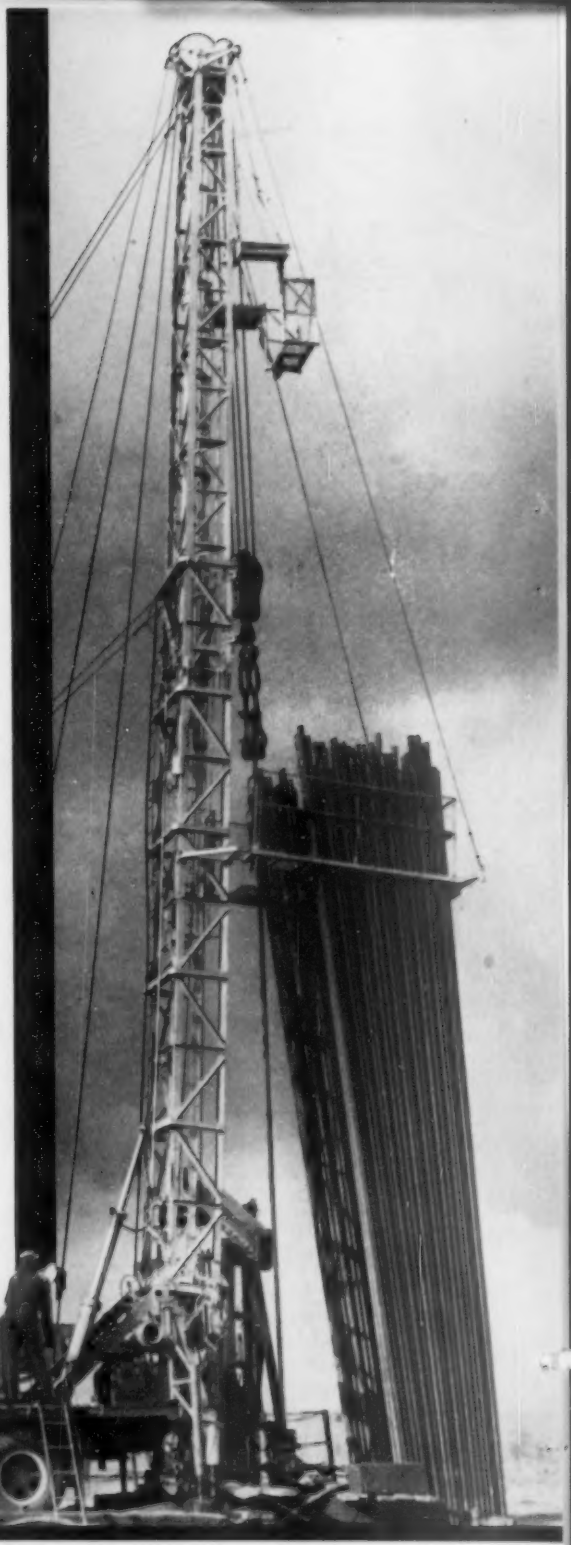

Above: Powered by truck motor — four sizes in either single or double drum models, for servicing to 10,000 ft.

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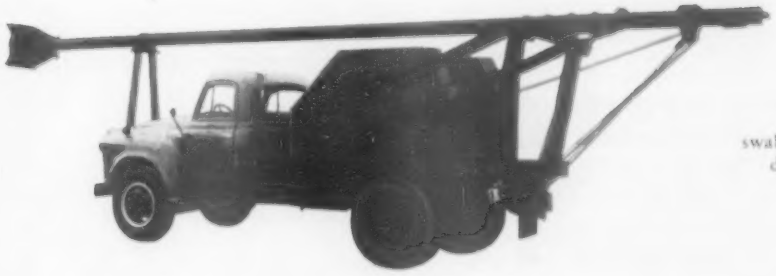

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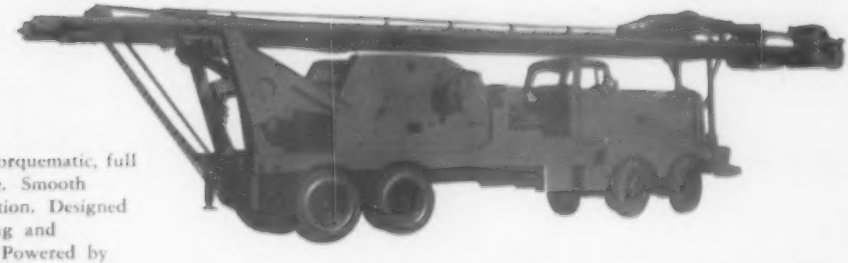

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MID-CONTINENT

NORTH TEXAS

Liles Pool Gets Flowing Confirmation Well

The Liles (upper Caddo) field 3 miles southeast of Throckmorton in Throckmorton County, gained a north offset producer and confirming well to the discovery.

Tennessee Gas Transmission Co. 1 Bailes flowed 170 bbl. of 41° oil a day on 16/64-in. choke, from pay topped at 4,251 ft. The well had been drilled to 4,829 ft., then plugged back to 4,283 ft. Tubing pressure was 180 psi. and gas-oil ratio 520:1. Location is in Section 292, BBB&C Survey. The same operator's 1 Beulah Liles opened the field.

Wise County . . . Christie, Mitchell & Mitchell have scheduled a deepening operation for 1 D. B. Whitehead, 3 miles southeast of Chico field, in C. D. Mixon Survey, A-536. New work and testing will take the hole to 6,000 ft. It was originally drilled to 3,010 ft., then later deepened to 5,858 ft.

OKLAHOMA

High Flow Reported At Seminole Prospect

A pool well at Wetley, Seminole County, flowed 70 bbl. of new oil per hour on ¾-in. choke from the Earlsboro sand at 1,803-13 ft. The prolific well is Lee Evans Drilling Co. 6 Johnson, SW NW SW 18-5n-6e.

The Weltey well also flowed 5 bbl. of oil per hour by heads from the Hunton lime through perforations at 2,494-2,536 ft., after acid treatment.

Short Junction Moves Northeast

Cleveland County's big Short Junction field was extended northeast last week by Ohio Oil Co.'s 1 Dieckman, C SW NE 17-10n-3w. The well flowed 4,000 M.c.f. of gas per day and 32 bbl. of oil in 22 hours on ¼-in. choke from perforations at 7,600-50 ft. in the Hunton.

West Red Rock Field Well Flows Gas-Distillate

Continental Oil Co. 1 Whitecloud, a field well in Noble County's West Red Rock field, flowed 46 bbl. of distillate and 16,804 M.c.f. of gas per day on

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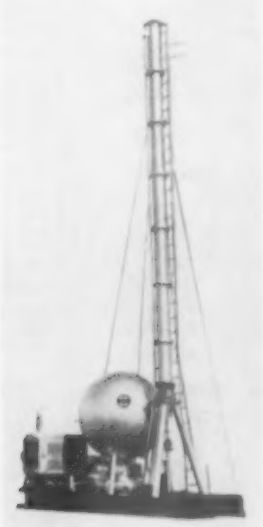
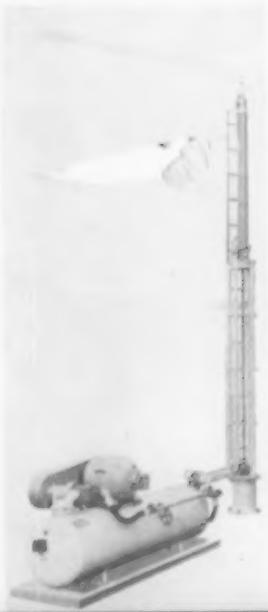
HYDRAX 10-foot CB. This husky counterbalance unit can produce oil from a depth of almost two miles. Stroke is 10 foot, polished rod load is 18,000 lb. (max.). Cycle rate is 8 strokes per minute (max.). Power requirements are low. Choice of two mountings: Casing Mount and Skid Mount which permits unit to be skidded back from well head. Write for Bulletin H-153.



HYDRAX LONG STROKE CB. These are the giants for pumping deep wells and those with high-volume production. Stroke length is 26½ ft. operating at 7 cycles per minute (max.). Polished rod load is 32,000 lb. (max.). The long slow pumping rate reduces wear and tear on sucker rod strings, subsurface pumps and mechanical equipment. Write for Bulletin H-0300.

HYDRAX 6 & 10-foot. These are non-counterbalanced pumping units ideal for light duty production and for pumping viscous and problem wells. They are available either with 6-foot or 10-foot strokes. Polished rod load for both models is 13,000 lb. (max.). Maximum cycle rate for 6-ft. unit is 4.6 CPM; for 10-foot unit is 4.4 CPM. Write for Bulletin H-153.

HYDRAX 4-foot JR. The Junior is the ideal unit for pumping low production and stripper wells of 50 B/D or less. It mounts directly to the tubing nipple and requires no foundation. All controls are at ground level. Polished rod load is 8,000 lb. (max.). Stroke length 4-ft., 6 cycles per minute, ½ HP for most applications is sufficient. Write for Bulletin H-050.



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½-in. choke from Red Fork sand-Pennsylvanian perforations at 4,190-4,242 ft. Gas ratio is 365,000:1. The well is just south of Ceres field.

A reentered wildcat in Blaine County, northwestern Oklahoma, flowed gas from the Chester-Mississippian, opening first production in the county. Location is 13 miles south of Ringwood field.

Blaine County Gets First Production

The list of producing counties in Oklahoma grew one more last week. Blaine County in the northwestern part of the state added its first producing area. The rank discovery well, 13 miles south of Ringwood field, is John W. Coyle, Jr. and Perkins Brothers 1 Dougherty, SW SW SW 10-19n-11w.

The well flowed 3,735 M.c.f. of gas per day on 21/64-in. choke on test on the Chester-Mississippian at 7,415-7,570 ft. Recovery was 3,200 ft. of gas-cut mud. This wildcat was first drilled earlier in the year, but was abandoned. The operators only recently went back into the hole. Location of the important discovery is just off the northeast rim of the Anadarko basin.

Field Conference Guidebook Available in Oklahoma City

The Oklahoma City Geological Society announces that copies of the guidebook on the society's recent field conference through the Oklahoma Panhandle, northeastern New Mexico, and south-central Colorado is available from the treasurer of the society in Oklahoma City.

The field conference was held in conjunction with the society's thirty-fifth anniversary. The conference was dedicated to the late Dr. C. N. Gould, who pioneered the geology of the panhandles.

WESTERN CANADA

SASKATCHEWAN

Two More Strikes Reported in Southeast

Imperial Oil, Ltd.'s southeast Saskatchewan exploration project has resulted in new oil discoveries at its 13-20 Oxbow and 9-10 Alameda wells according to official drill-stem tests released by that company. The first of these new strikes is situated 3 miles west of Oxbow railpoint 8½ miles east of the Frobisher oil field and the Alameda find is 1¾ miles northwest of Alameda railpoint and 2¾ miles east of Imperial's 5-8 Alameda previous oil discovery well.

Imperial 13-20 Oxbow, on LSD 13, 20-3-2w2, topped the Charles at 4,385 ft. and porosity at 4,434 ft. Drill-stem test of the interval 4,432-80 ft. gave up 150 ft. of oil-cut mud, 120 ft. of oil, and 10 ft. of water.

At the 9-10 Alameda strike, on LSD 9, 10-4-3w2, the operator carried hole to total depth 4,570 ft., after testing both the Charles and Mission Canyon sectors of the Mississippian, seven of the eight drill-stem tests attempted were successful. The best test in the Charles was of the interval 4,441-64 ft. It gave up a pipe recovery of 180 ft. of oily mud and 390 ft. of oil, no water. In the Mission Canyon, test from 4,474-84 ft. yielded 180 ft. of oily mud, 630 ft. of gassy oil and 510 ft. of salt water. Both tests are standing at total depth, prior to running production tests.

ALBERTA

Belly River Oil Discovery At Edson-Whitecourt

The team of Hudson's Bay Oil & Gas, Ltd., Stanolind Oil & Gas Co. and Canadian Fina Oil, Ltd., has an oil discovery on its large acreage spread of reservation rights in the Edson-Whitecourt region of west-central Alberta. The team's newest strike was recorded in the basal Belly River zone at the Hudson's Bay operated 1 Pine Creek test on LSD 2, 10-58-19w5, placing it 33 miles north of Edson townsite and 45 miles west-southwest of Whitecourt town.

The Belly River zone was topped at 4,135 ft. and during a drill-stem test of the interval 4,856-71, in the base of the zone, 634 ft. of light-gravity, clean oil, 90 ft. of oil-cut mud and 30 ft. of mud entered the drill pipe.

This well lies 8 miles north of the team's 1 Beaver Creek capped potential gas well and 26 miles southwest of the Windfall gas discovery wells. The team holds 11 P. & N. G. reservations in the region covering one million acres.

Hussar Area Wildcat Is Oil Discovery

Tennessee Gas Transmission Co. carrying out extensive work on an 800,000-acre farmout from Mobil Oil of Canada, Ltd., in southwestern Alberta has another oil discovery on that tract. The new well was being drilled as a gas development well in the Hussar area, 30 miles south of Drumheller and 55 miles east of Calgary, but during drill-stem tests in the glauconitic sand, gas along with a spray of light-gravity crude were recorded at the surface and pipe recoveries of clean oil were made.

This well, T.G.T.-Mobil-C.P.R. 9-1 Hussar, on LSD 10, 9-24-20w4, is offset on three sides by previous gas successes. Two other wells in this drilling program, but in a separate area to the new strike, have indicated oil production from the same sand, but only one has been completed as an oil well, the other was found to contain commercial gas so therefore was capped.

The oil zone at the new discovery was topped at 4,423 and a pair of drill-stem tests covering a 48-ft. section

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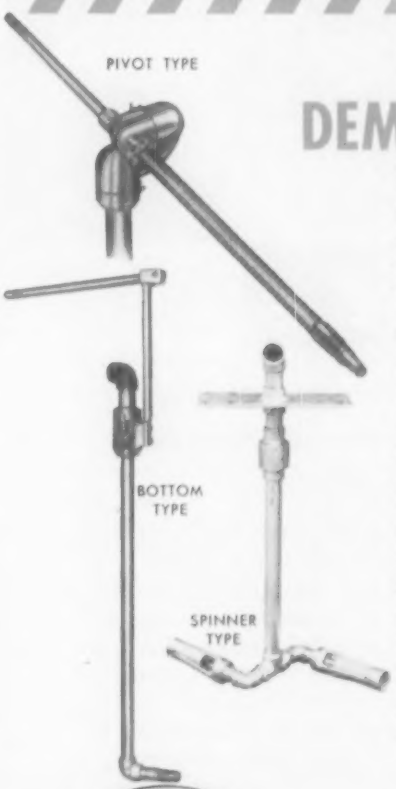

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flowed gas at rates up to 5.6 million cubic feet daily while pipe recoveries consisted of 160 and 215 ft. of clean oil, respectively.

Belloy-Odessa Region Gets Gas Strike

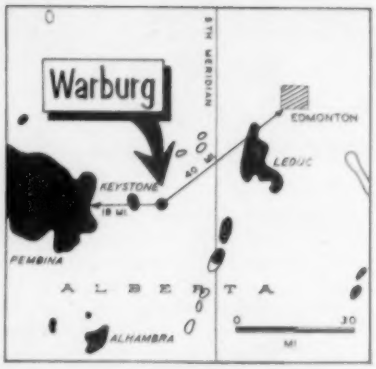
British-American Oil Co.'s 6-21 Rahab, exploratory test in the Belloy-Odessa region of northwest Alberta, 43 miles south-southwest of Peace River town and 50 miles north-northeast of Grande Prairie, discovered gas in indicated commercial volume in the Notikewin zone of Lower Cretaceous according to an official release from that company. This well, 6-21 Rahab, on LSD 6, 21-78-1w6, is 1¾ miles east of the Imperial 2 Belloy suspended Permo-Penn oil discovery well and 2 miles northwest of the Imperial 12-14 Belloy Gething formation gas discovery.

Notikewin top was not announced, but drill-stem test between the interval 1,860-70 ft. gave up gas at maximum daily rate, 5,700,000 cu. ft. There was no pipe recovery.

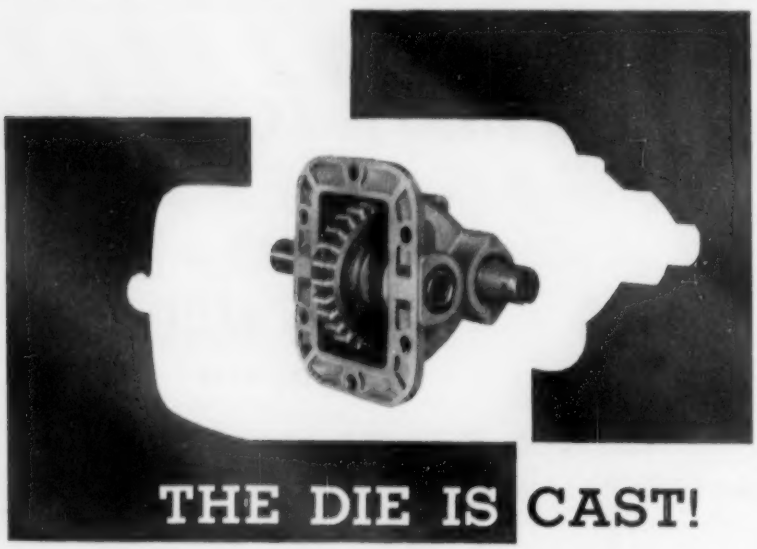
Texaco Exploration Co. has chalked up an interesting show of oil and gas in the Mississippian formation at its A-1-25 High River exploratory test, 5½ miles southwest of High River town and 30 miles south of Calgary city limits and reported that production casing will be run in an effort to fully evaluate that show. Initial test in the Mississippian formation flowed gas by heads at maximum rate 100,000 cu. ft. daily and gave a pipe recovery of 30 ft. of clean oil, 30 ft. of oil-cut salt water and 180 ft. of heavily oil-cut mud while the second gave up only oil and gas-cut mud with the third indicating that the water line had been reached, giving up 60 ft. of oil-cut mud and 780 ft. of salt water.

This well, Texaco A-1-25 High River, LSD 1, 25-18-30w4, is situated ⅝ mile east-northeast of the 1 Arca Development wildcat abandonment that was drilled in 1937 to a total depth of 8,988 ft. Arca showed some oil encouragement in the Mississippian but was later proved noncommercial.

This current well topped the Mississippian horizon at a subsea elevation of 4,691 ft., while at the Arca test, the Dalhousie that yielded some oil encouragement was topped at an elevation of 4,980 ft. subsea. Tests for production at the Arca well were carried out in the perforated interval 8,550-8,660 ft. Fluid rose about 200 ft. in 8 hours and recovery was 5 bbl. of oil and 15 bbl. of water in 40 hours.



A multiple-pay discovery at Warburg, 19 miles east of Pembina, holds regional exploratory interest in western Canada. Cree Oil of Canada, Ltd., 7-10A Warburg, LSD 7, 10-48-3w5, 40 miles southwest of Edmonton, recovered oil on test of the Mississippian, has indicated oil production in the Cardium sand, and commercial gas prospects in the basal Belly River and Viking sands.



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ROCKY MOUNTAIN

UTAH

Discovery East of Aneth Completed In Hermosa

An Hermosa-Pennsylvanian discovery 9 miles east of Aneth field proper in San Juan County was completed

flowing, 1,420 bbl. of oil per day on 1-in. choke. Perforations were at 5,585-5,625 ft. There were no shows in the Paradox, big Paradox basin pay zone. The discovery well is The Texas Co. 1 Navajo-J in C NE NE 20-40s-26e.

The Recapture Creek discovery, west of Aneth field proper in C SE SW 21-40s-23e, was shut in. The Shell Oil Co. well flowed 34 bbl. of oil in 2 hours from perforations at 5,354-58 ft. and 5,363-74 ft. The distance between Recapture Creek through Aneth to The Texas Co. 1 Navajo-J is 18 miles.

NORTHWEST NEW MEXICO

Gallup Sand Discovery Finaled in San Juan

A Gallup sand discovery 2½ miles east of the southern end of Bisti field in San Juan County was completed flowing 802 bbl. of oil per day. The Shell well, 1 Carson, is in C NE NE 24-25n-12w. There has been no drilling between this discovery and Bisti itself.

COLORADO

Gas Wells at Garmesa Nearing Completion

Four apparent lower Buckhorn gas producers in Mesa County's Garmesa area are nearing completion. The operators are Beehive Uranium and Standard Uranium Co. The discovery well is the 1 Young in SE NW 6-8s-102w. This well recovered more than 6,000 M.c.f. of gas daily on drill-stem tests of the Dakota and lower Buckhorn. Mechanical troubles have plagued the operators at the other three wells.

Location of the Garmesa area development is 1¼ miles southeast of the old Garmesa field, a 1925 discovery.

PACIFIC COAST

CALIFORNIA

San Mateo Activity On Upswing

Activity in San Mateo County in northern California was on the upswing again after a series of dry holes hit operators trying to follow up a discovery in the Oil Creek area scored by Union Oil Co. late last year.

Neaves Petroleum Co. was drilling ahead at 310 ft. on a test in NW SE 17-7s-4w. This is in the rugged mountain recreation area of LaHonda about 6 miles northwest of Oil Creek field which was in 14-8s-3w.

Union was rigging a rotary to drill a northwest stepout to the Oil Creek discovery in 10-8s-3w. Union was also getting a location ready for another wildcat more than 4 miles northwest of Oil Creek field in the Peters Creek region.

The third operator in the play, Richfield Oil Corp. has completed site preparations on a wildcat also in the Peters Creek region.

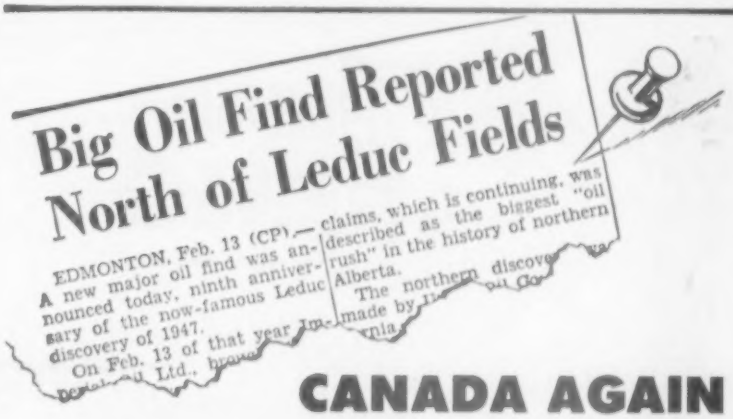
The Texas Co. was drilling ahead below 6,738 ft. on a wildcat in 11-7s-5w, which is in the San Gregorio Rancho area.

Standard Abandons West Montalvo Deep Test

Standard Oil Co. of California has abandoned 148-12 McGrath, the West Montalvo Sespe pool discovery well the operator originally completed in February 1951. Standard recently went back into this Ventura County well and redrilled it from 12,110 ft. to 14,182 ft. in an unsuccessful search for deeper production.

Western Gulf Completes Santa Fe Discovery

Western Gulf Oil Co. has finally completed its wildcat 1 mile east of Santa Fe Springs field in the Los Angeles Basin for a new pool discovery. Spudded in last April, the operator had been plagued by fish jobs and water


Big Oil Find Reported North of Leduc Fields
EDMONTON, Feb. 13 (CP) — A new major oil find was announced today, ninth anniversary of the now-famous Leduc discovery of 1947.
On Feb. 13 of that year Imperial Oil Ltd., brought
claims, which is continuing, was described as the biggest "oil rush" in the history of northern Alberta.
The northern discovery was made by

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While the Bank is prepared to provide all available information on the oil industry, it does not make recommendations regarding the purchase of individual oil stocks.

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troubles. It was completed flowing 38 bbl. daily of 39.4°-gravity crude from two intervals in the 9,557 ft. hole. The upper interval is at 8,156-8,218 ft. and the lower at 8,888-9,045 ft.

BASIN AND RANGE

NEVADA

Richfield Slates New Nevada Test

Richfield Oil Corp. will drill another wildcat in northeast Nevada. This one, 1 Scott - Ogilvie - Federal, will be spudded in the Bull Run basin in southwest 22-43n-52e, approximately 57 miles northwest of Elko. Richfield abandoned a 7,349 ft. wildcat in the Rabbit Creek region last June on a farmout from Gulf Refining Co.

ARIZONA

Kerr-McGee to Drill in Arizona

Kerr-McGee Oil Industries, Inc., has obtained a permit to drill a wildcat approximately 45 miles east of Holbrook on the Pinta anticline. This test of this 30,000 acre structure is located in NE SW 34-20n-26e. The acreage was assigned to Kerr-McGee by the Apache Oil & Helium Corp. of Fresno, Calif. The Kipling Petroleum Co. made a discovery of the highest content of helium ever found in North America on this structure in 1950.

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GREAT LAKES

MICHIGAN

Overisel Field Follow-up Flows Gas

The Taggart Co. 1 Krooze, Busscher, Koopman, C NW 16-4n-14w, first follow-up test to the yet uncompleted Overisel field Salina gas producer, Allegan County, was boosted from 560,000 cu. ft. of gas natural to 1,250,000 cu. ft., gaged, by a 2,000-gal. acid treatment. This satisfactory increase with a small acid shot appeared to be all that company needed to plan and launch a gas development program in the Overisel field area which sprawls north and south the entire length of the township.

Unofficial report from a geologist who has studied the correlation between the Traverse lime (original oil producing horizon for Overisel), and this Salina deeper pay objective indicates that this deeper zone appears to check out very closely with the structure reflected on the Traverse. The Taggart Co. has blocked a large spread of leases in the area.

Gas pay section (all dolomite), in this new producer was 16 ft. thick. Hole was bottomed out at 2,675 ft. Rotary drilling was in progress at test No. 3, The Taggart Co. 1 Hoffman-Klaffen, C SE 16-4n-14w, below 400 ft.

• Additional gas pay was reported to have been penetrated by deepening 20 ft., more or less, at Clifford A. Perry 1 House-Knecht, NW SE NE 10-5s-3w, Scipio Township Trenton objective wildcat, Hillsdale County. Very little accurate information was available from this wildcat, but conservative estimates indicated that well showed for about 1,000,000 cu. ft. of gas when rotary tools penetrated Trenton another 20 ft. Other estimates calculated gas flow between ½ million and 2 million cubic feet. Information about depths, pay thickness, etc., will be released later. Trenton was topped at about 3,563-75 ft. Hole is believed to be bottomed out now between 3,722 and 3,742 ft.

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WEST TEXAS-NEW MEXICO

SOUTHEAST NEW MEXICO

Lea County Well Plugged Back for Pennsylvania Strike

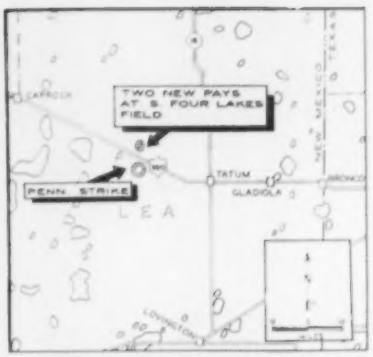
Phillips Petroleum Co. and Texas Pacific Coal & Oil Co. 1 Ranger, wildcat 4 miles southeast of East Bagley field, northern Lea County, has been completed as a Pennsylvanian discovery.

Operators drilled the well to 12,977 ft., total depth, then plugged back to 10,563 ft. Final perforations at 10,312-61 ft. flowed 406 bbl. of 41° oil a day through ¼-in. choke. Tubing pressure was 750 psi. and gas-oil ratio was 1,096:1.

Pay perforations apparently were in the top of the formation. Lowest marker reported at this writing was the Pennsylvanian Bend at 11,476 ft. Location is in SE SE 23-12s-34e, about 10 miles due west of Tatum.

Sinclair 1 Seaman completed . . . Sinclair Oil & Gas Co. 1 Seaman, wildcat 9 miles northeast of Maljamar in west-central Lea County, has been completed as a flowing Pennsylvanian discovery.

Initial potential was 612 bbl. of oil, plus 121 bbl. of load water, in 24 hours on ¾-in. choke. Perforations were from 11,219-65 ft. Gas-oil ratio was 1,979:1.



Uppermost discovery on the map is Humble 2 South Four Lakes Unit, one location south of the field discovery. The No. 2 well has added Wolfcamp and Devonian production to the field. The Pennsylvanian strike is Phillips Petroleum and Texas Pacific 1 Ranger in 23-12s-34e. Potential was 406 bbl. from 10,312-61 ft.

No. 1 Seaman was drilled to 14,797 ft. It had top of the Devonian at 14,480 ft. on elevation of 4,169 ft., but tests throughout the formation had no shows.

Humble Oil & Refining Co.'s deep wildcat northeast of Lovington has been completed dry at 14,433 ft. Location is in 32-15s-36e, Lea County.

WEST TEXAS

Irion County Has New Pool, New Pay

Irion County operations for the week included the opening of a new pool, discovery of a second pay at Lucky-Mag field, and other prospects.

Plymouth Oil Co. completed its 1 A. A. Sugg estate, 15 miles northwest of Mertzon, for 480 bbl. of 38° oil a day. Production was through ½-in. choke, from perforations in the Wolfcamp at 5,890-5,912 ft. The wildcat had been drilled to 8,091 ft., then plugged back to 6,060 ft.

The new pay at Lucky-Mag field, 4 miles northwest of Mertzon, is Phillips Petroleum Co. 1-A Nutt, in 41-L&SV Survey. Potential was 108 bbl. of 37° oil a day, on the pump, from lower Clear Fork pay at 3,412-30 ft.

Nearest established Clear Fork production is 12½ miles to the west in Ketchum Mountain field.

A Wolfcamp prospect was seen at Southwestern Development Co. et al Sugg, Section 1893-B, Verbene Survey, 10 miles northwest of Mertzon in Irion County.

A 90-minute drill-stem test at 5,532-51 ft. had gas in 6 minutes and recovered 1,700 ft. of clean 32.7° oil,

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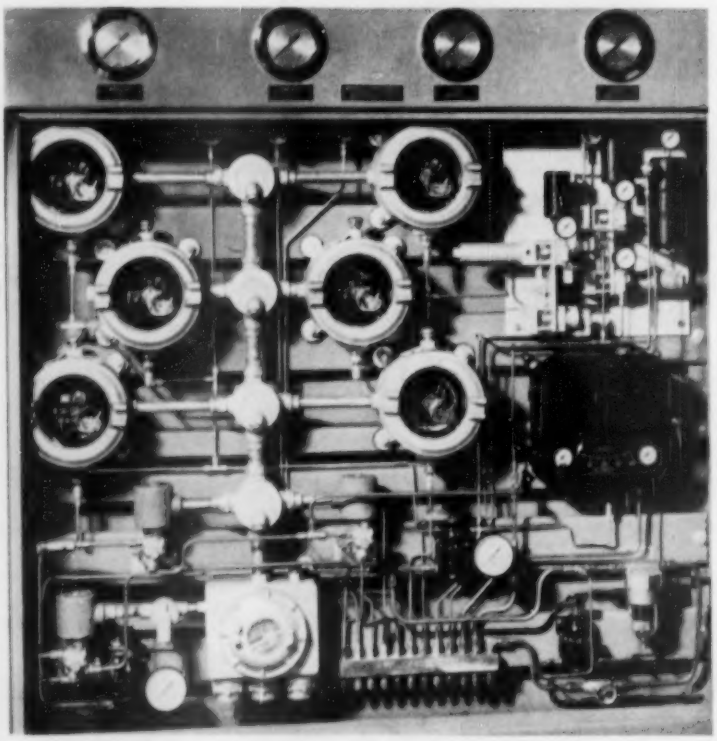

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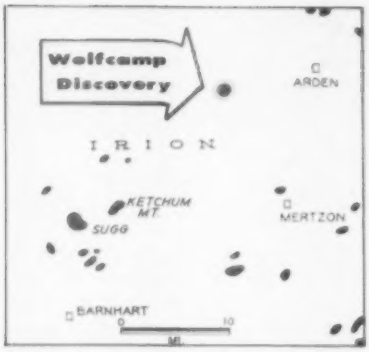

Map shows Plymouth Oil Co. 1 A. A. Sugg estate, in 14-6-H&TC, northwest of Mertzon in Irion County. The discovery flowed 480 bbl. of oil a day on potential test.

plus 121 ft. of heavy oil and gas-cut mud.

Gaines County . . . Jake Hamon et al 1 Randolph, located 23 miles east of Seminole in Section 12, Block 285, Schleicher CSL, has been completed on the pump as a Mississippian discovery.

Potential was 51.47 bbl. of 39° oil, plus 10 per cent water, from perforations at 11,580-95 and 11,614-24 ft.

Cities Service Oil Co. 9 Proctor, deep exploration in the shallow West Seminole field, Gaines County, has been completed as a Devonian discovery.

Completion potential was 334 bbl. of 38° oil in 24 hours through 1-in. choke. There was no water, gas-oil ratio was zero and flowing tubing pressure was 25 psi. Production is from perforations at 11,181-91 ft. Top of the Devonian was 11,106 ft., or minus 7,641 ft.

Location of Cities Service' new producer is in Section 355, Block G, CCSD&RGNG Survey, 10 miles northwest of the town of Seminole.

WEST-CENTRAL TEXAS

Fisher County Well Completed for 374 BOPD

Ab-Tex Production Co., Abilene, and Hill & Hill, Fort Worth, have completed a good Canyon sand discovery 2 miles north of Hamlin in Fisher County. Location of the well in Section 183, Block 1, BBB&C Survey, is slightly over ½ mile southeast of Strawn production in Coffin field.

The discovery made a calculated flowing potential of 374.4 bbl. of 41° oil a day, based on a 17-hour flow of 266 bbl. through 16/64-in. choke. Pay was perforated at 4,125½-51½ ft., washed with mud-acid and fractured. Tubing pressure on the test was 350 psi., with gas-oil ratio of 650:1.

The strike is separated from Jones & Stasney 3 Bryan in Section 184, same block and survey, by dry holes in the Canyon sand. No. 3 Bryan flowed 132 bbl. of oil a day from the Canyon at 4,318-57 ft.

SOUTH TEXAS

TEXAS GULF COAST

Moody Ranch Area Opens Deeper Gas-Bearing Sand

H. J. Chavanne's discovery well in the Moody Ranch area, southeastern Jackson County, is rated good for 21,600,000 cu. ft. of gas per day, open-flow potential. It tested daily flow rates ranging from 525,000 cu. ft. through 3/32-in. choke to 1,213,000 cu. ft. through 9/64-in. choke. Pressures ranged from 2,512-51 psi. Shut-in pressure is 2,677 psi.

It is a new pay discovery, the Weed (Frio) sand, with perforations at 7,291½-97½ ft. Gas carried an ungaged volume of 61°-gravity condensate.

The well, 1 W. L. Moody, Jr., had been drilled to 7,512 ft. and has casing at 7,423 ft. Location is 7 miles southeast of La Ward.

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SOUTHWEST TEXAS

Duval County Wildcat Tests Gas-Condensate

Gas-condensate production has been established in a semiwildcat test drilled by San Patricio Oil Corp. and Pratt-Hewit Oil Corp. 15 miles north of San Diego, in northwestern Duval County.

The well is the 1 Black, in the J. Poitevent Survey 129, northwest of the Pettus oil-producing La Juana area. Its flow through 5/32-in. choke was gaged at the rate of 40,000,000 cu. ft. of gas per day. Liquid recovery was in the order of 10 to 12 bbl. per 1,000,000 cu. ft. of gas. Pressure was 1,650 psi.

Hole was drilled to 4,670 ft. and cased to bottom. Production is from perforations at 4,603-13 ft.

SOUTH LOUISIANA

Avery Island Joins Fields With 15,000-Ft. Production

Avery Island, in Iberia Parish, has been added to the swelling list of South Louisiana fields with production below 15,000 ft.

Humble Oil & Refining Co. last week completed its 40 Petit Anse, on the northeast flank of that dome, with pay at 15,476-96 ft. (perforations). It flowed 374 bbl. of 39.1°-gravity oil per day through ⅛-in. choke with pressure of 2,500 psi. and gas-oil ratio of 880 cu. ft. per barrel.

Production on the northeast flank opens another fault segment. Deepest production until now has been about 13,000 ft.

Duson-Ridge Extension Hints at Three-Field Link

The Duson-Ridge area of western Lafayette Parish is getting a 2-mile production-extension and a deeper pay in the completion by Sunray Mid-Continent Oil Co. and Buffalo Oil Co. of their 1 Bruner as a gas-condensate well from perforations at 13,320-29 ft.

The well is southwest of these operators' Duson field, where production (gas and condensate) is from sands ranging in depth from 9,900 to 11,000 ft. It is about the same distance northwest of their two wells at Ridge, one productive from a 12,150-ft. sand, and the other from a 11,950-ft. zone.

It is less than 3 miles southeast of a lone gas-condensate well completed last June by J. P. Owen as a new-field discovery (West Duson) with production from a 11,800-ft. zone.

Sunray's extension well is rated at 2,400,000 cu. ft. of gas per day through ⅛-in. choke. No gage of liquid recovery was reported. Flowing pressure is 8,800 psi. Shut-in bottom-hole pressure is 10,000 psi. Pay is identified as the Bolovian - Mexicana zone. The well had been drilled to 15,210 ft. Location is in 17-10s-3e, on a 1,700-acre block.

LINKING extension discovery (indicated by white star) by Sunray Mid-Continent Oil Co. in Duson-Ridge area, Lafayette Parish.

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STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Five Vermilion Fields Get Extensions and New Pays

Five Vermilion Parish fields got extension and new-pay discoveries last week.

A northwest extension at Maurice, just south of the Lafayette parish line, confirms discovery of the field, opened last March by Seaboard Oil Co. The extension well 1 Baudoin, is potentially productive from at least three zones.

It tested 115 bbl. of 55°-gravity condensate with 2,300,000 cu. ft. of gas per day through ⅛-in. choke from perforations at 9,490-95 ft. Flowing pressure was 2,950 psi. From perforations at 10,553-57 ft., flow was 183 bbl. of oil and 58 bbl. of water per day through ⅛-in. choke with pressure of 950 psi. and gas-oil ratio of 500 cu. ft. per barrel. Perforated at 10,602-05 ft., the well flowed an unreported volume of fluid, 50 per cent 43.6°-gravity oil and 50 per cent water.

Seaboard's discovery well was productive of gas and condensate from perforations at 11,380-94 ft., a deeper zone than any tested in the confirmation-extension well.

Northeast of the north extension area of Erath field, southeast of Abbeville, Robert W. Mosbacher is completing his 1 Erath Sugars, making 2,500,000 cu. ft. of condensate-spraying gas per day through ⅛-in. choke from perforations at 12,096-12,126 ft. Flowing pressure was 4,400 psi. Gravity of the fluid is 55°. Total depth is 12,824 ft.

Stanolind Oil & Gas Co. has an outpost well off the southwest flank of Florence field, in the western part of the parish. Its 3 Watkins, in 13-13s-2w, flowed 48 bbl. of 43.8°-gravity condensate with 2,372,000 cu. ft. of gas per day during tests through 11/64-in. choke. Pressure gaged 3,025 psi. Total depth is 12,068 ft.

Ohio Oil Co. is confirming production at Theall field, in the south-central part of the parish. Its well is a northeast offset to Pano Tech Exploration Co.'s discovery well, completed last January. It flowed gas and condensate, recording pressure of 4,000 psi. through 5/32-in. choke. Pay is at 11,810-15 ft. in hole bottomed at 11,900 ft. Pano Tech's well produced gas and condensate from perforations at 11,580-93 ft.

West of Live Oak field, in the southeastern part of the parish, Atlantic Refining Co. is testing gas-condensate production at its 1 Live Oak Unit 1. Flow through ¼-in. choke was at the rate of 6,395,000 cu. ft. of gas per day with pressure of 4,350 psi. Pay is perforated at 13,172-85 ft. Total depth is 13,243 ft.

LOUISIANA OFFSHORE

C.A.T.C. Group Completes Offshore Oil Producer

The C.A.T.C. group, with Continental Oil Co. as operator, has completed a semiwildcat oil producer in the southeast corner of Block 82, West Delta area, in the Gulf of Mexico, at the southwest tip of Mississippi River's Southwest Pass, Plaquemines Parish.

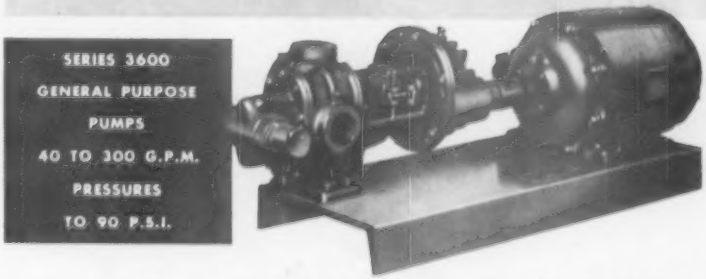
Location is northeast of California Co.'s South Pass Block 41 field, opened in April 1955, and in which three oil producers have been completed in two pays—7,950 ft. and 10,100 ft.

Continental's well, 2 State Lease 987, was drilled to 11,029 ft., has 5½-in. casing at 10,350 ft., and is perforated in Miocene sand at 10,152-66 ft. It flowed 266 bbl. of 30.6°-gravity oil per day through 9/64-in. choke with pressure of 1,600 psi.

Successful Wildcats

WEST TEXAS

Crockett County: Texas Gulf Producing Co. 1 University "T," 16-47-ULS, 23 miles SE Big Lake. IPP 30 BOPD, 6 bbl. water, 35°, Grayburg 1,719-1,968 ft. TD 2,119 ft. Suggested field name: Blk. 42, E. Ector County: Phillips Petroleum Co. 1 Ed-



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wards "B," 19-43-T3S-T&P, 13 miles SW Odessa. IPF 172 BOPD, 33°, GOR 491, San Andres 4,268-90, 4,300-20 ft. TD 13,545 ft., PB 4,345 ft. New pay opener.

Upton County: R. C. Banks 1 Kincaid, 18-1-MK&T, 9 miles E McCamey. IPP 47 BOPD, 37°, GOR 1728, Queen sand 1,636-44 ft. TD 2,130 ft.

NORTH TEXAS

Wise County: Carter Jones Drilling Co. 1 Nysa Hoskins, W. A. Ross Sur., A-959, 1½ miles NW Chico. IP 153.5 BO in 8 hours, 24/64-in., 41°, TP 300 psi., GOR 300, pay 5,323 ft. TD 5,833 ft.

EAST TEXAS

Smith County: Warren Petroleum Corp. 1 Starnes, John W. Allen Sur., A-50, 4 miles NE Starville. IP 134 BOPD ¼-in., TP 200 psi., 42°, GOR 440, Pettit 8,251½-55½, TD 8,762 ft. Ground elev. 480 ft.

SOUTHEAST NEW MEXICO

Eddy County: General American Oil Co. of Texas 1 Federal-Sivley, 8-16s-30e. IP 644 BOPD, 24/64-in., 36°, TP 260 psi., GOR 474, Premier sand perforations 2,648-66 ft. TD 2,978 ft.

R. A. T. Wright 1 Gulf-State, 36-16s-29e. IP 58 BOPD, 18/64-in., CP 240 psi., GOR zero, 34°, Grayberg 2,580-92 ft. TD 2,751 ft.

NEW MEXICO

San Juan County: Shell Oil Co. 1 Carson, C NE NE 24-25n-12w. IPF 802 BOPD, Gallup sand discovery, new field in Bisti area. TD 5,983 ft. Morrison.

UTAH

San Juan County: The Texas Co. 1 Navajo "J," C NE NE 20-40s-26e. IPF 1,420 BOPD, 1-in. choke. Hermosa discovery, new field. TD 5,832 ft. Paradox.

WYOMING

Sweetwater County: British-American Oil Producing Co. 1 Unit, C NE SW 12-14n-103w. IP 2,700 M.c.f. of gas per day, Frontier and Lakota discovery, new field. TD 7,355 ft. Morrison.

COLORADO

Bent County: D. D. Harrington 1 Carl Earl "A," C SW NE 15-22s-49w. IP 10,000 M.c.f. of gas per day, Cherokee-Pennsylvanian discovery, new field. TD 4,800 ft. Mississippian.

SASKATCHEWAN

Imperial 13-20 Oxbow, LSD 13, 20-3-2w2. Charles oil discovery. TD 4,480 ft.

Imperial 9-10 Alameda, LSD 9, 10-4-3w2. Charles oil discovery. TD 4,570 ft.

CALIFORNIA

Los Angeles County: Western Gulf Oil Co. 1 Newgate Unit A, NW NE 9-3s-11w, 38 BOPD, 39.4° gravity, 36/64-in. choke, 32 per cent cut, perfs. 8,156-9,045 ft., TD 9,557 ft. (New field discovery 1 mile east of Santa Fe Springs field.)

TEXAS PANHANDLE

Hansford County: The Texas Co. 1 Carmody, C SW SW Block 45, Sec. 69, H&TC Sur. IPF 1,782 BOPD, Atoka sand 7,099-7,116 ft. 39.3°, 1-in. choke. TD 7,170 ft. (Oil discovery.)

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Exploration Geophysicists Meet in New Orleans

THE Society of Exploration Geophysicists (S.E.G.) will hold its twenty-sixth annual meeting in New Orleans, La., October 29-November 1. Here is the scheduled program.

Registration Sunday afternoon, October 28 and Monday morning, October 29 at the Roosevelt Hotel.

Opening Session
Monday Afternoon, October 29

1. Address by president.
2. Awards.
3. The S.E.G. petitions the American Institute of Physics for admission as a member society.
4. Address on the American Institute of Physics by a prominent physicist. (Speaker will be announced later.)
5. "The Part Played by Statistics in Exploration," by Frederic H. Lahee.
6. Business session.

Technical Sessions
Tuesday, October 30
9:00-12:00 a.m. (Gulfshore)

1. Principal address.
2. "Geology and Geophysics of the Gulf of Mexico," by Paul L. Lyons.
3. "Offshore Exploration in the Eastern Hemisphere," by W. St. J. White.
4. "Future Offshore Oil Provinces of the World," by T. R. Goedicke.

5. "Analysis of Offshore Domes from Gravity Surveys," by L. L. Nettleton.

6. "Recommended Practices in the Handling and Use of Seismic Explosives," by T. L. McCorkle.

2:00-5:00 p.m. (Instrumentation and Research)

7. "Design Principles for Seismic Reflection Amplifiers," by A. J. Hermont.

8. "Methods of Filtering Seismic Data," by Mark K. Smith.

9. "Display of Magnetically Recorded Seismic Data," by C. F. Hadley and J. D. Eisler.

10. "A Time-Depth Conversion Camera," by E. G. Perry.

11. "The Gulf Seismic Profile Printer," by E. M. Palmer.

12. "Airborne, Portable and Station Nuclear Precession Magnetometers," by Kenneth E. Hunter.

13. "An Optical Analog Gravity Computer," by R. W. Baltosser and S. W. Wilcox.

14. "The Directivity Effect of Elongated Charges," by A. W. Musgrave, G. W. Ehlert, and D. M. Nash, Jr.

15. A safety paper to be announced, by Knute Flint.

Wednesday, October 31
9:00-12:00 a.m. (Offshore)

16. "A Review of Pacific Coast Offshore Seismic Methods," by Carl H. Savit.

17. "Multiple Reflections in Offshore Seismic Operations," by John Brustad.

18. "Wave Propagation in a Liquid Layer," by D. T. Liu.

19. "On a Theoretical Method for Identifying Rock-Type and Obtaining in Situ the Shear Modulus (Rigidity) of Bottom Sediments in Water-Covered Areas," by E. Strick.

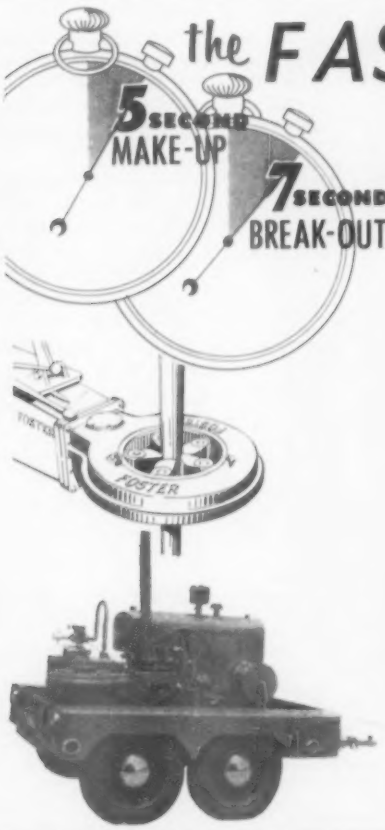
20. "Field Equipment, Techniques and Interpretive Procedures of the Offshore Seismic Crew," by H. L. Grant.

21. "Geophysical and Geological Investigation of Sea Mounds in the Gulf of Mexico," by W. E. Allen, L. Stanley, and T. F. Vining.

22. "A Refraction Procedure for Delineating Salt Domes," by W. Lee Moore.

23. "Factors Affecting the Accuracy of Phase Comparison Positioning System," by B. W. Koeppel.

24. "A Direct-Ranging Phase-Comparison Method of Radiolocation," by Joseph DeLerno, Jr.



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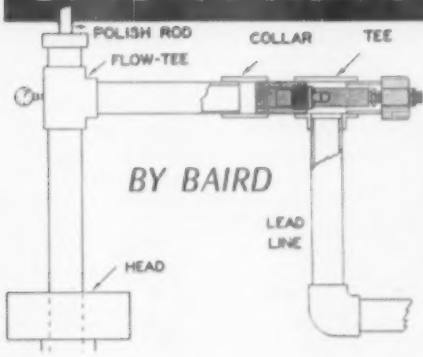

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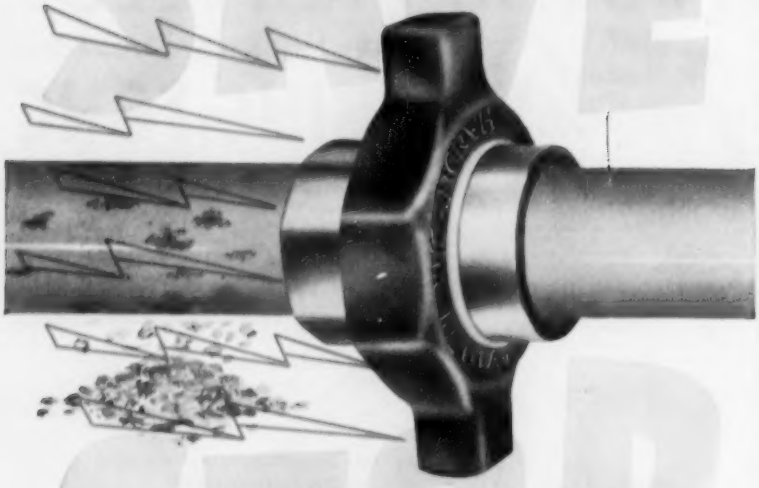

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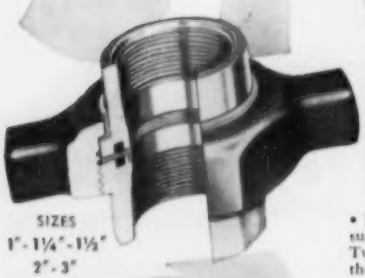

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2:00-5:00 p.m. (Foreign Exploration and Model Studies)

25. "Land Exploration in the Eastern Hemisphere," by T. F. Gaskell.
26. "Some Aspects of Geophysical Prospecting in French Territories," by Pierre Moussel and Jean Millouet.
27. "Model Studies of Salt Dome Tectonics," by Travis J. Parker.
28. "A Seismic Model with Six Detectors," by H. O. Walker, Jr.
29. "Diffraction From Wedges," by W. L. Roever.
30. "A Seismic Model Study of the Phase Velocity Method of Exploration," by Frank Press.
31. "Model Studies of Bubble Dynamics in Offshore Shooting," by W. C. Knudsen.
32. "Analog Studies of Induced Polarization Effects Over a Layered Earth," by Charles J. Zablocki.

Thursday, November 1
9:00-12:00 a.m. (The International Geophysical Year, Gravity and Magnetics)

33. "The Interntaional Geophysical Year," by Hugh Odishaw.
34. "Seismology and Gravity in the I.G.Y. Program," by Perry Byerly.
35. "Technical Aspects of the Earth Satellite Tracking and Their Geophysical Applications," by J. Allen Hynek.
36. "The Use of Gravity Surveys to Determine Possible Fault Trends," by Lawrence S. Morrison.
37. "Aeromagnetic Mapping of Regional and Local Basement Structure," by Nelson C. Steenland.
38. "Polar Movement as Indicated by Rock Magnetism," by Lynn G. Howell and Joseph D. Martinez.
39. "An Electrical Crevasse Detector," by John C. Cook.

2:00-5:00 p.m. (Economics, Case Histories, and Problems)

40. "Patents in the Service of Geophysics," by O. F. Ritzmann.
41. "Treatment of Geophysical Expenditures for Federal Income Tax Purposes," by J. W. Yarbro.
42. "Geophysical History of the Chachahoula Dome," by W. E. Hollingsworth and H. C. Weston.
43. "Case History of the Redwater Field," by C. J. Chapman.
44. "Geophysical Case History, Cabin Creek Field, Fallon County, Montana," by L. F. Schombel.
45. "The Importance of the Structural Interpretation of Seismic Data," by R. A. Weingartner.
46. "Difficulties in Seismic Prospecting Resulting From Bubbles in Fluids," by J. O. Parr, Jr.
47. "The Granite Wash in Western Canada," by J. C. Sproule.

Entertainment

Ladies' and men's entertainment program remains as previously announced. The dress for the dance Wednesday night in the Grand ball room of the Roosevelt Hotel will be optional.

Field Trip
Friday, November 2

Busses will leave the Roosevelt Hotel Friday morning at 7:30 for Grand Isle, La. En route a demonstration of marsh seismic work using marsh tractors and a marsh gravity crew with helicopter will be observed.

A seafood dinner will be served at Grand Isle, then boats will be boarded for a cruise to the offshore area. A demonstration of gravity and seismic offshore work and observation of offshore drilling rigs and producing methods will be included.

New A.A.O.D.C. president sees . . .

. . . More Engineers in Drilling

THE role of the engineer in the drilling business has become much more important in recent years.

But this, thinks Jack Abernathy, new president of the American Association of Oilwell Drilling Contractors, is just the beginning.

Contractors are going to become more and more engineering-conscious in the years ahead.

Abernathy, vice president and general manager of Big Chief Drilling Co., Oklahoma City, is well qualified to predict on that score. He is a petroleum engineer by education and spent 12 years in the production-engineering end of the industry prior to his switch to contracting with Big Chief in 1945.

Abernathy's first real contact with the oil business came halfway through his college career at Oklahoma University. He spent the summer of 1930 working as a roustabout in Oklahoma City field. He liked what he saw so much that he switched from mechanical engineering to petroleum engineering.

Upon his graduation in February 1933, he joined Sinclair Oil Corp.'s research and development organization in Chicago. He spent 2 years there, working mostly on improving design of natural-gasoline plant equipment.

In 1935, he resigned to join Sunray Oil Corp. as a junior engineer and had advanced quickly to chief engineer by late 1938. During this period, he directed drilling operations on the State Capitol grounds in Oklahoma City during the Oklahoma City field boom. Public interest was stimulated when Sunray bottomed one of the first directionally drilled holes in the Mid-Continent under the capitol building.

Abernathy left Sunray in 1942 to become chairman of the Oklahoma City Wilcox Pool Engineering Association—formed primarily to unitize and water flood the field. These plans were stymied by the World War II oil emergency, however, and he resigned the post to rejoin Sunray in early 1943 as general superintendent.

He held this job until he got the chance in November 1945 to own a bit of the oil business by joining Big Chief.

The new A.A.O.D.C. president says he wouldn't go back. "The work is exciting . . . you can't get bored with it . . . and satisfying. Contracting is a hard taskmaster. The rigs never let you up. But it's worth it."

He doesn't look for any revolutionary change in the basic method of drilling wells within the foreseeable

future. Progress will be evolutionary instead. By this he means that the present mechanical-energy method and its basic tools—the prime mover, the pumps, the hoisting equipment, the drill string, and the bit—will be with us for a long time yet. Such evolutionary equipment as possibly the turbodrill will be merely "new tools in the chest." Contractors, as has been the trend, can expect "more horses and more pumps" in the next few years.

Activity spread . . . It's hard for the casual observer to see how Abernathy could possibly find the time to run his drilling business.

He is unusually active in the work of both the A.A.O.D.C. and the Production Division of the American Petroleum Institute. This year he served as vice president of the Central Mid-Continent area of the A.A.O.D.C. and as a member of the research and education committee (which he previously has headed as chairman for 2 years). He also is chairman of the A.P.I. Production Division's national steering committee for drilling practice. He in recent years has served the Mid-Continent district of the A.P.I. Production Division as chairman, vice chairman, and secretary-treasurer and has been active on several A.P.I. standardization committees.

Along with this, Abernathy currently is vice chairman and oil-industry member of the Oklahoma State Board for Registration of Professional Engineers and chairman of the oil and gas division of the Oklahoma City Chamber of Commerce. His energy and talent for getting things done are in demand continually by civic groups and fund-raising charities.

He admits that he and Big Chief co-owner W. T. Payne, who likewise is active in community and association affairs, spend most of their weekends catching up at the office.

All this leaves little spare time for relaxing but when he does find time Abernathy likes to devote it to trout fishing. He, as do most of trout fraternity, has his favorite, secret spot which he will narrow down only to "somewhere in Colorado."

He has one other indirect hobby which is more-or-less involuntary in helping his 14-year-old daughter, Carilee, with her hobby—breeding and showing German Shepherd show dogs.

Abernathy married the former Miss Mary Ann Staig in 1932. The Abernathy's also have one son, Jack H., Jr., 22, who currently is working at O. U. toward a master's degree in engineering physics.

E. B. Rubsamen, Jr., drilling engineer with The California Co., has been transferred from Venice, La., to Leeville, La.

A. J. Stone, assistant division geologist with Phillips Petroleum Co. in Denver, has been transferred to Houston as geologist.

Richard W. KixMiller, vice president in charge of Celanese chemical division for Celanese Corp. of America, has been named a director of the company. He replaces **Charles F. Beran,** who has retired.

Douglas Kise, formerly with Sinclair Oil & Gas Co. in Denver, and **Palmer Kise,** consulting geologist in Oklahoma City, have formed the K-B Oil Service Co. in Oklahoma City. The firm will handle geological, land, and promotion work.

William E. Bush has succeeded the late H. F. Owen as field manager of Berry Holding Co., Ethel D. Co., Berry Oil Co., Berry & Ewing, Surprise Oil Co., C. J. Co., and Big Ten Oil Co. in Bakersfield, Calif. Bush was formerly engineer for the Berry companies.

Edgar L. Cralle, district engineer for Cities Service Oil Co. at Odessa, Tex., has been promoted to district superintendent of the company's production division. **Keith Van Horn,** assistant to the division engineer at Great Bend, Kans., will succeed Cralle at Odessa.

Personals

James D. Kersey, geologist with Seneca Oil Co., has been transferred from Oklahoma City to Tulsa.

Hamilton L. Tingey, geological consultant, has moved his offices from Conrad, Mont., to Cut Bank, Mont.

James E. Thompson, petroleum engineer with Gulf Oil Corp., has been transferred from Fort Worth to Roswell, N. M.

William O. Miller has been transferred by Shell Oil Co. from development engineer at Bakersfield, Calif., to the area office in Los Angeles.

Edward Branson, vice president in charge of exploration for Turner Petroleum Co., Mount Pleasant, Mich., has resigned to become an independent geologist and operator in the southern Illinois field.

John H. Weems, district geologist in Sohio Petroleum Co.'s Kansas district, has been transferred to the company's Midland district in the same capacity.

Jack Wahl has been appointed manager of the Calgary offices of James A. Lewis Engineering, Inc., and vice president of James A. Lewis Engineering, Ltd., of Canada. A graduate of the University of Tulsa, Wahl was with Atlantic Refining Co. before joining the Lewis firm in 1952 as reservoir engineer.

W. J. Greenwald, assistant division petroleum engineer with Humble Oil & Refining Co. in Tyler, Tex., has been promoted to reservoir engineer and transferred to Houston.

Glen D. Ralston has joined Continental Oil Co. as assistant reservoir engineer in Westlake, La. He formerly was with Socony Mobil Oil Co. in Augusta, Kans.

Alfred Iddles, president of Babcock & Wilcox Co., has been elected president of Atomic Industrial Forum, Inc. He succeeds **Walker L. Cisler,** president of Detroit Edison Co. Among the Forum's directors are **Ross W. Thomas,** vice president, Phillips Petroleum Co.; **John Perry Yates,** senior vice president, Bechtel Corp.; **A. L. Lyman,** president, California Research Corp.

A.A.O.D.C. Cites Two for Outstanding Service

Two A.A.O.D.C. leaders were presented awards at the association's annual meeting last week. In the left photo, Don Slape, right, of Don Slape Drilling Co., Olney, Ill., receives the President's Award for outstanding leadership in national association work from outgoing A.A.O.D.C. president, E. Dale Mount, Harry Bass Drilling Co., Dallas. In the right photo, a special award for outstanding service with a local chapter is presented to Baker R. Littlefield, right, of Power-Rig Drilling Co., Lafayette, La., by J. L. Stauss, Falcon Seaboard Drilling Co., Tulsa.

Lewis J. Bicking, Jr., division engineer for Ashland Oil & Refining Co., has joined Pan-American Engineering Corp. as production manager in Corpus Christi, Tex.

James M. Davis, tool pusher with Reed Drilling Co., has been appointed drilling superintendent for the company in Okemah, Okla.

Gulf Oil Co. has appointed a general manager and managers of three new divisions—services, operations, and engineering—at its five domestic refineries. The new appointments were made in a reorganization of major managerial assignments. At Gulf's Port Arthur, Tex., refinery **R. C. Faulkner** has been named general manager, with **F. L. Bryan,** manager, services; **T. F. Hogan,** manager, operations; and **H. M. Vaughan,** manager, engineering. At the company's Philadelphia refinery **J. O. Timms** has been appointed general manager; **H. W. Magee,** manager, services; **R. J. Metcalf,** manager, operations; and **T. A. Dietz,** manager, engineering.

At the Staten Island refinery, new managers are **William M. Braybrooks,** general manager; **F. C. Fichtl,** services; **A. H. Grant,** operations. At Toledo, **D. E. Hart** has been named general manager; **R. P. Ricketts,** services; **H. A. Bailey,** operations; and **J. K. Warne,** engineering. At Cincinnati, **A. A. Niehenke** is general manager; **R. P. Petrick,** manager, services; **L. L. Laster,** operations; and **W. S. Reeder,** engineering.

Hugh D. Barton, section head for Humble Oil & Refining Co. in Houston, has been transferred to Tyler, Tex., as assistant division engineer.

Nolen R. Morse, senior geologist for Sohio Petroleum Co.'s Oklahoma district, has been transferred to Amarillo, Tex., where he will head the company's new offices there. **Wallace W. Hanson,** senior geologist in Wichita, Kans., has also been transferred to Amarillo.

Fred W. Evans has been named assistant to the president of Surpass Petrochemicals, Ltd., Scarboro, Ont., and Alox Corp., Niagara Falls, N. Y. Evans was formerly supervisor of process development and research for Hooker Electro Chemical Co.

Dr. Carroll A. Hochwalt, Monsanto Chemical Co.'s vice president for research, development, and engineering, has received the 1956 Midwest award of the American Chemical Society's St. Louis section. Dr. Hochwalt was cited for "scientific achievement, for leadership in industrial research, and for contributions to the dignity of the scientist as a citizen."

Lyle Harvey has been elected president of the New Orleans Geological Society. Harvey is with John W. Mecom, New Orleans. Other officers are **D. D. Wingfield,** Monterey Oil Co., vice president; **C. S. Killgore,** Continental Oil Co., secretary; **R. M. Jemison,** Freeport Sulphur, treasurer.

Howard L. Garrett, Shell Oil Co., has been elected president of the Billings, Mont., Geological Society.

Leonard A. Murphy, geologist with Phillips Petroleum Co. in Casper, Wyo., has opened consulting offices in Denver.

John M. Starke, vice president in charge of gas purchases for Southern Natural Gas Co., has been transferred from Birmingham, Ala., to the company's new Houston office.

John H. Emerson III, petroleum engineer with Gas Gathering Co. in Corpus Christi, Tex., has joined Coastal States Gas Producing Co. in Corpus Christi as engineer in charge of the Texas City system.

Leon R. Vesley, district geologist for Amerada Petroleum Corp., has been transferred from the South Texas district to the Oklahoma district, Oklahoma City. **Elgin Deidrick**, assistant East Texas district geologist, will succeed Vesley in the South Texas district.

Harvey J. Dupuy, area drilling engineer for The California Co.'s West Delta area in Venice, Calif., has been promoted to assistant division petroleum engineer with offices in Harvey, Calif. **William H. Schell,** supervising petroleum engineer in East Delta area, succeeds Dupuy at Venice.

R. S. Cannon, chief electrical engineer for Plantation Pipe Line Co. in Atlanta, Ga., has been named chairman of the Petroleum Industry Committee of the American Institute of Electrical Engineers. **L. E. Oberhelman,** head engineer for Standard Oil Co. (Ind.) in Sugar Creek, Mo., is vice chairman, and **T. V. Bockman,** of Corpus Christi, Tex., is secretary.

E. P. King, superintendent of the technical department at Pure Oil Co.'s Smiths Bluff refinery, Nederland, Tex., has been transferred to the company's Chicago office. He will head a group in the operating division of the refining department. **Norman Banta,** superintendent of the Smiths Bluff light-oil and cracking department, will succeed King. **William E. Norris,** chemist and supervisor of oil accounting at Smiths Bluff, also has been transferred to Chicago. In other changes, **Victor H. Trumphy,** formerly superintendent of operations at Pure's Toledo refinery, has been named technical foreman at Smiths Bluff. **Marvin Keeney,** formerly yield supervisor at the company's Cabin Creek, W. Va., plant, has been appointed maintenance foreman at Smiths Bluff.

Stanley D. Conrad, formerly with Peruvian Pacific Petroleum Co. in Talara, Peru, has joined Richfield Oil Corp. as geologist in Casper, Wyo.

Frank C. Osment, formerly assistant chief geologist in charge of programs for Stanolind Oil & Gas Co., has been appointed manager of exploration planning for the company. Osment is a graduate of Birmingham Southern College and the University of Illinois. He joined Stanolind in 1945 as a geologist.

Robert O. Pearson, chemical engineer with Fractionation Research, Inc., in Alhambra, Calif., has joined Tidewater Oil Co. in Delaware City, Del., as process engineer.

Frank M. Ross, prominent Canadian industrialist and lieutenant governor of British Columbia, has been named a director of Westcoast Transmission Co., Ltd.

M. Frank Turner has been named special representative in the West Texas-New Mexico district by Warren-Bradshaw Exploration Co. Turner was formerly with Howard P. Holmes Drilling Co. in Hobbs, N. M.

Personals

L. A. Braden, district engineer for Tidewater Oil Co., Ventura, Calif., has been transferred to Los Nietos, Calif.

Ernest H. Bibitzke, reservoir engineer with The Texas Co. in Midland, Tex., has been promoted to district reservoir engineer and transferred to Pampa, Tex.

Robert J. Beams, chief petroleum geologist for Howell, Holloway & Howell, has resigned to open consulting offices in Dallas.

M. L. Bright, staff assistant to the general manager of pipelines for Gulf Oil Corp. in Houston, has joined British American Oil Co., Ltd., as pipelines manager. Bright will be responsible for the company's pipeline operations in western Canada. He is a graduate of Texas A. & M. College. Bright replaces **J. J. Thorp,** who has returned to the United States.

Harold E. Radford, district production superintendent for Shell Oil Co., has been transferred from Brea, Calif., to South Mountain, Calif. **William E. Rehm,** district production superintendent in South Mountain, has been promoted to district production superintendent for Shell's San Joaquin Valley oil fields.

DEATHS

Neal Whisenhunt, 80, once president of Zigler Dredging Co. and secretary-treasurer of the Jennings-Haywood Oil Syndicate in Louisiana, died October 2 in Houston. Whisenhunt was a pioneer in oil developments in the Spindletop field and in Louisiana. He was the author of several books on Texas wildlife since his retirement in 1937.

Thomas Edward (Ed) Schley, 72, assistant superintendent of Magnolia Petroleum Co.'s Beaumont, Tex., refinery before his retirement in 1949, died October 1 in Beaumont.

J. L. (Johnny) Copeland, 59, district superintendent for Interstate Oil Pipe Line Co. in Magnolia, Ark., died there recently.

Ross Chenault, long-time employe in Trinidad Oil Co.'s production department in the Caribbean, died recently in New York after an operation for cancer. Chenault has been associated with D. T. O'Connor, export representative for a group of oil-field specialty equipment manufacturers, for 5 years.

John Joseph (Jack) Linehan, retired general superintendent of Sinclair Pipeline Co., died September 4 in Tulsa. Linehan entered the pipeline business in 1890 when he joined the old Buckeye Pipeline Co. in Ohio. He came to the Oklahoma area in 1910 as division superintendent of Prairie Pipeline Co. in Bartlesville. He retired from Sinclair in 1942. Linehan was the father of J. Marston Linehan, president of Mid-Continent Pipe Line Co., and Richard A. Linehan, head of the land department in Ohio Oil Co.'s Oklahoma City offices.

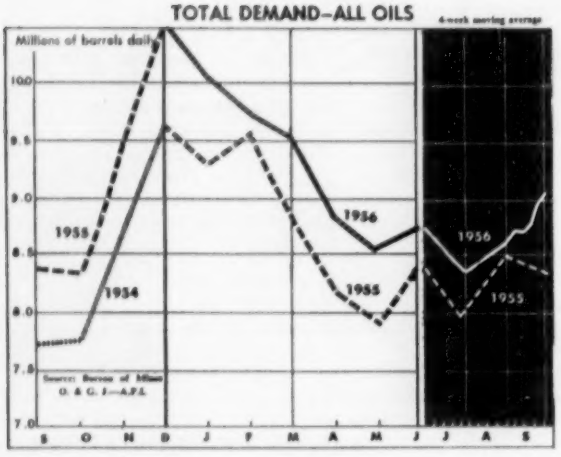
James J. McGerry, Grand Rapids, Mich., independent operator, died September 29 after an illness of several weeks.

Ray Delay, 56, Laredo, Tex., oil man, was fatally injured in an automobile accident October 2 about 50 miles west of Little Rock, Ark.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,054,675	DOWN	4,975	UP	256,795
Crude stocks	278,656,000	UP	4,053,000	UP	23,858,000
Completions	1,120	UP	85	UP	10
Refinery runs	7,697,000	DOWN	215,000	UP	506,000
Gasoline stocks	176,000,000	UP	1,280,000	UP	24,994,000
Kerosine stocks	33,243,000	DOWN	574,000	DOWN	3,112,000
Distillate stocks	151,805,000	UP	1,438,000	UP	6,207,000
Residual stocks	47,299,000	DOWN	200,000	UP	278,000
Four-product stocks	408,347,000	UP	1,944,000	UP	28,367,000
Total imports	1,488,200	DOWN	78,800	UP	344,900



Crude Stocks Don't Actually Change 5,000,000 Barrels Per Week

ACCEPT a big weekly change in crude stocks with a grain of salt. If the change is over 5,000,000 bbl. in anything like normal times, add a generous sprinkling of salt.

There were two unusual changes reported in September —the first a decrease and the other an increase. Both represented abnormal reporting by companies.

For the week ended September 8, the crude-stock report showed a reduction in inventories amounting to 5,255,000 bbl. for the week. The estimate of crude production for that week was 7,045,000 bbl. daily. Crude imports for the week averaged 975,000 bbl. daily, according to the A.P.I. report. This adds to a total new crude supply of 8,020,000 bbl. daily.

Crude exports, transfers, and losses averaged 96,000 bbl. daily for the first 7 months of this year and probably would not be much higher for a particular week. Refinery runs averaged 8,187,000 bbl. daily to give a consumption total of 8,283,000 bbl. daily.

Crude use for the week exceeded new crude supply by 263,000 bbl. daily or 1,840,000 bbl. for the week. Allowing for some variation in exports and unreported adjustments in production, the actual reduction in crude stocks probably was somewhere between 1,600,000 and 2,100,000 bbl.

For the week ended September 29 the weekly report shows a gain of 4,053,000 bbl. in crude stocks.

Crude supply for the week was 8,122,000 bbl. daily made up from 7,060,000 bbl. daily of production and 1,062,000 bbl. daily of imports.

Probable withdrawals amounted to 7,993,000 bbl. daily, including 7,897,000 bbl. daily by refineries and 96,000 bbl. daily for exports, transfers, and losses.

The difference is 129,000 bbl. daily or 903,000 bbl. for the week. Even with no exports for that week, the gain would have been only about 1,100,000 bbl.

East Coast distillate prices vary . . . Not all marketers agree on light-fuel prices on the East Coast. Esso Standard Oil Co. announced its price increases effective October 1. For most areas north of Norfolk, the increase amounted to 0.4 cent a gallon.

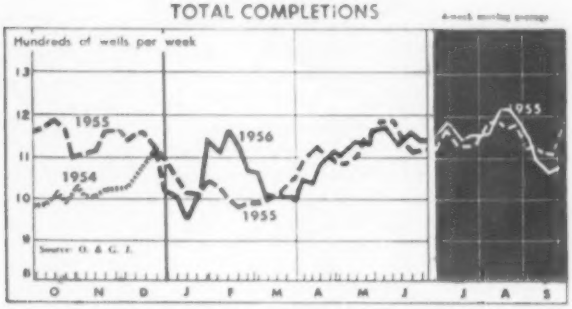
Atlantic Refining Co. raised the differential between kerosine and No. 2 fuel to 0.75 cent a gallon from the 0.5-cent spread that has been in effect for most of the East Coast area. The new Gulf Coast cargo prices show a kerosine-No. 2 differential of 0.75 cent.

Socony Mobil Oil Co. also announced price changes that vary somewhat from the Esso quotations. In some areas, Socony's posting for No. 2 fuel was 0.1 cent a gallon below Esso's price. Also, Socony raised its price for No. 4 fuel by 13 cents a barrel to become the first to include residual fuel in the increase. Esso later cut its price for No. 2.

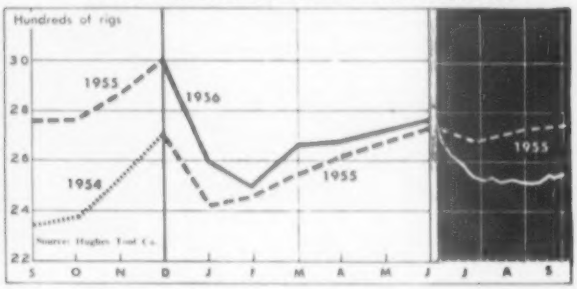
Some of the marketers in the Mid-Continent have lowered the base price for contract purchases of gasoline to 11.50 cents a gallon, down 0.25 cent. Normal spot sales were down to 11.50 cents before the end of June and to 11.25 cents before the end of August.

Gasoline continues weak on the Gulf Coast with little to no demand for spot material.

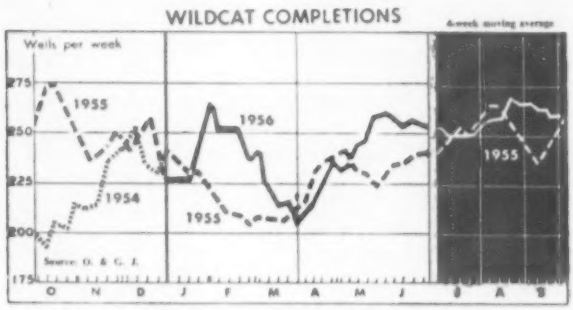
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	10-8-56	10-1-56	10-10-55
North Central and East	120	141	134
Southeast	41	37	36
Okla., Kans., Ark., Mo.	468	449	511
Louisiana	425	420	424
North and East Texas-Panhandle	355	372	394
Gulf and South Texas	249	244	251
West Texas-New Mexico	500	500	538
Rocky Mountain	274	276	323
Pacific Coast	115	106	142
Total United States	2,556	2,546	2,753
Western Canada	248	242	192

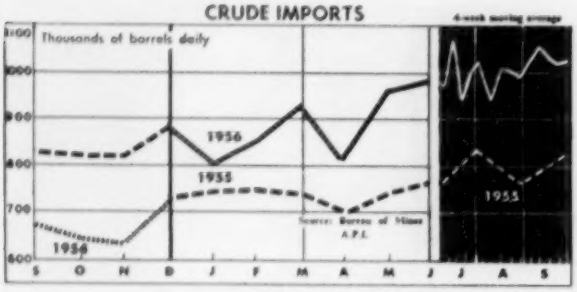
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 6, 1956

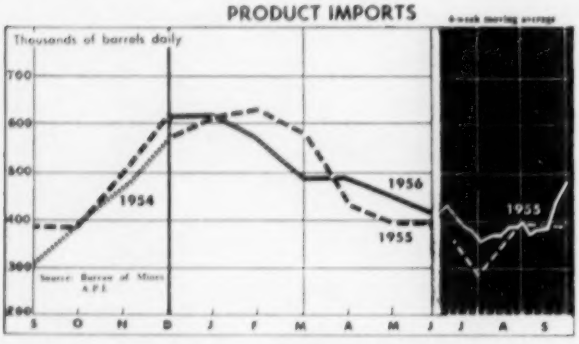
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp.	Oil	Gas	Dry	Footage	1956	1955	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	1	0	0	11,479	82	62	0	0	0	0	0	0	0	1	35	36
Arkansas	29	19	0	10	82,726	705	615	0	0	0	4	4	28	0	4	114	146
California	60	46	0	14	270,520	1,716	1,882	1	0	0	11	12	42	0	9	358	409
Colorado	35	14	3	18	168,484	921	1,155	1	0	1	16	18	21	0	12	457	490
Illinois	101	38	0	63	230,303	2,972	2,981	2	0	0	22	24	40	0	3	538	581
Indiana	23	6	0	17	36,286	527	568	0	0	0	5	5	14	0	1	93	108
Kansas	88	40	10	38	329,499	3,845	3,874	5	0	0	15	20	97	2	30	696	825
Kentucky	47	19	1	27	60,837	1,430	1,178	1	0	0	14	15	32	0	1	301	334
Louisiana	93	38	10	45	730,951	2,947	3,061	2	1	3	16	22	88	45	48	409	590
North	41	16	4	21	161,087	1,281	1,588	0	0	0	6	6	23	2	3	167	195
South	42	18	4	20	464,661	1,339	1,473	2	1	2	9	14	53	38	32	212	335
Offshore	10	4	2	4	105,203	327		0	0	1	1	2	12	5	13	30	60
Michigan	7	4	1	2	22,959	337	411	0	0	0	1	1	7	0	1	123	131
Mississippi	9	2	0	7	61,479	344	347	0	0	0	4	4	13	1	1	153	168
Montana	8	3	0	5	41,084	349	291	0	0	0	4	4	10	0	1	117	128
Nebraska	14	3	1	10	76,188	753	657	1	0	1	7	9	32	0	1	336	369
New Mexico	11	0	9	2	50,133	1,464	1,302	0	0	0	2	2	37	0	8	154	199
Northwest	11	0	9	2	50,133	637	432	0	0	0	2	2	8	0	7	53	68
Southeast	0	0	0	0	0	827	870	0	0	0	0	0	29	0	1	101	131
North Dakota	10	8	0	2	74,483	201	197	0	0	0	2	2	8	0	0	52	60
Ohio	38	25	8	5	98,359	806	924	0	0	0	1	1	2	0	2	6	10
Oklahoma	154	84	7	*63	519,078	6,461	6,565	2	1	1	12	16	99	17	31	539	686
Pennsylvania-New York	3	0	3	0	10,232	769	1,186	0	0	0	0	0	0	0	9	11	20
Texas	348	207	16	125	1,603,735	17,014	15,551	6	3	3	84	96	578	31	143	3,588	4,340
Southwest (1 & 4)	28	14	0	14	69,756	2,416	2,377	1	0	0	12	13	108	6	47	668	829
Gulf Coast (2 & 3)	36	12	4	20	293,060	2,030	1,924	1	2	1	17	21	53	16	51	551	671
East (5 & 6)	26	12	3	11	143,942	892	757	1	0	0	8	9	13	2	5	297	317
N. Central (7-B & 9)	124	62	5	57	403,670	6,104	5,868	1	0	1	30	32	255	0	11	1,448	1,714
West (7-C & 8)	111	91	2	18	576,837	4,558	3,815	2	0	1	15	18	134	0	10	573	717
Panhandle (10)	23	16	2	5	116,470	1,014	810	0	1	0	2	3	15	7	19	51	92
Utah	2	1	0	1	11,889	98	77	1	0	0	1	2	4	0	4	50	58
West Virginia	11	0	9	2	30,712	517	496	0	0	0	0	0	0	0	9	9	18
Wyoming	28	11	2	15	98,689	660	655	0	0	0	10	10	14	0	8	171	193
Miscellaneous	0	0	0	0	0	70	45	0	0	0	0	0	4	0	0	59	63
Total U. S.	**1,120**	569	80	471	4,620,105	44,988	44,080	22	5	9	231	**267**	1,170	96	327	8,369	9,962
Total previous week	1,035	540	76	419	4,079,079			26	0	7	219	252	1,148	91	318	8,138	9,695
Total Oct. 8, 1955	1,110	581	64	465	4,546,452			29	4	10	254	297	1,265	164	279	7,751	9,459
Cumulative 1956	44,988	24,295	3,084	17,609	181,437,332												
Western Canada	76	55	6	15	354,793	2,411											

Service wells included: *7.

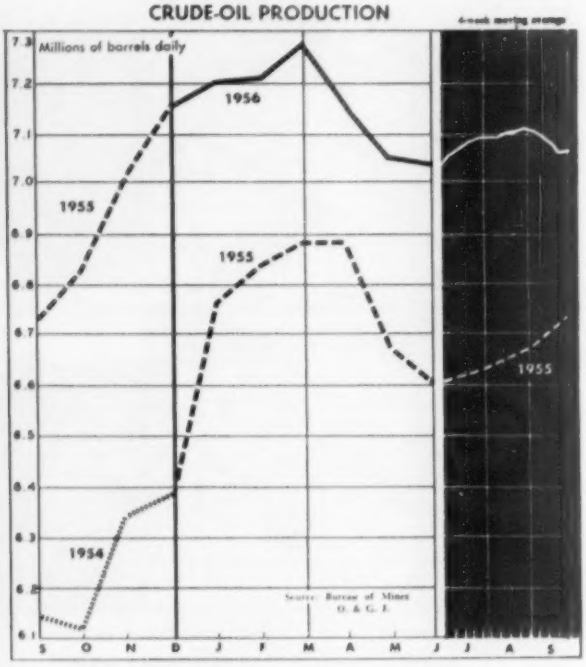
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

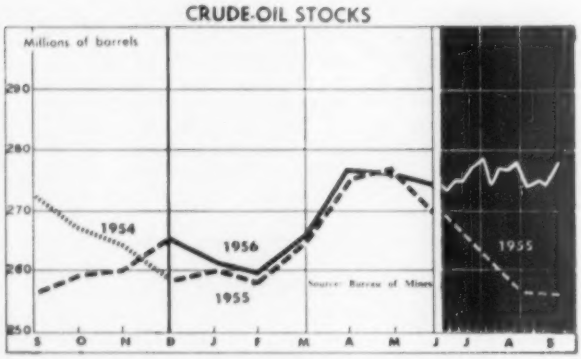


DAILY AVERAGE PRODUCTION FOR WEEK

	October 6, 1956			Sept. 29
	Crude oil	Lease condensate	Total	total
Alabama	9,900		9,900	9,000
Arkansas	77,200	300	77,500	79,650
California	959,300		959,300	958,200
Colorado	160,250		160,250	160,200
Eastern	51,200		51,200	51,300
Florida	1,300		1,300	1,325
Illinois	238,500		238,500	237,300
Indiana	31,900		31,900	32,300
Kansas	338,700		338,700	338,900
Kentucky	47,200		47,200	47,100
Louisiana	733,275	63,650	796,925	789,150
North	117,200	2,150	119,350	121,650
South	616,075	61,500	677,575	667,500
Michigan	28,300		28,300	29,000
Mississippi	108,925	4,700	113,625	112,625
Montana	62,000		62,000	63,600
Nebraska	38,700		38,700	39,100
Nevada	200		200	200
New Mexico	240,175	3,700	243,875	241,800
North Dakota	35,500		35,500	35,200
Oklahoma	†586,850		†586,850	†573,300
Texas	2,886,850	51,900	2,938,750	2,965,300
Dist. 1	56,000	500	56,500	56,450
Dist. 2	141,575	8,100	149,675	151,100
Dist. 3	412,575	24,500	437,075	443,200
Dist. 4	229,275	6,200	235,475	241,200
Dist. 5	41,425	450	41,875	42,900
Dist. 6	121,850	5,900	127,750	129,875
East Texas field	197,725		197,725	202,000
Dist. 7-B	158,275	50	158,325	159,050
Dist. 7-C	172,850	3,900	176,750	183,750
Dist. 8	1,042,150	1,600	1,043,750	1,041,600
Dist. 9	211,575	500	212,075	213,475
Dist. 10	101,575	200	101,775	100,700
Utah	5,100		5,100	5,100
Wyoming	289,000		289,000	289,900
Others	‡100		100	‡100
Total U. S.	6,930,425	124,250	**7,054,675**	7,059,650
Change from previous week, down			**4,975**	
Canada	†488,500		†488,500	†501,000
Total U. S. production January 1-October 6			1,998,889,675 bbl.	
Same period last year (crude plus cond.)			*1,881,628,331 bbl.	

*Includes 31,330,100 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

CRUDE-OIL STOCKS



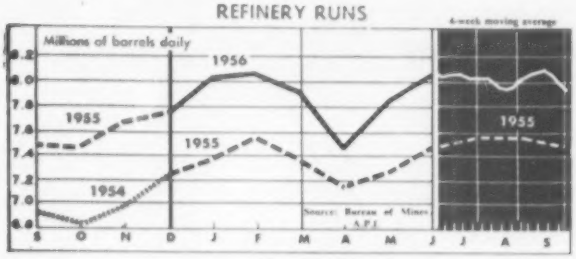
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

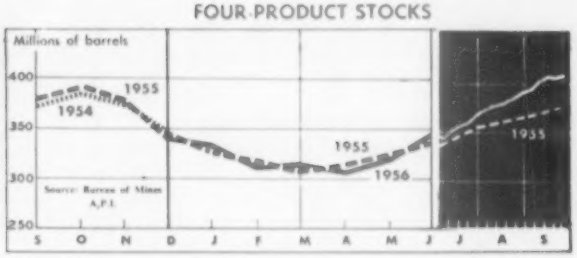
	9-29-56	9-22-56	10-1-55
Pennsylvania Grade	2,549	2,539	3,259
Other Appalachian	2,552	2,262	1,970
Illinois, Indiana, Michigan	11,352	11,460	10,081
Nebraska, North Dakota	2,204	2,220	2,169
Kansas	10,206	10,059	7,968
Oklahoma	25,840	25,871	20,629
Arkansas	2,824	2,719	2,602
Louisiana	17,532	17,839	16,199
North	2,561	2,500	2,600
South	14,971	15,339	13,599
Mississippi	3,030	2,990	3,268
New Mexico	8,595	8,412	7,218
Texas	125,115	121,912	119,657
East Texas proper	8,980	8,729	9,368
West Texas	60,914	58,642	56,742
Texas Gulf	23,644	23,250	24,372
Other Texas	31,577	31,291	29,175
Wyoming	17,095	17,155	14,669
Other Rocky Mountain	6,188	6,137	5,111
California	27,276	27,320	27,798
Foreign	†16,298	15,608	12,200
Total	278,656	274,603	254,798

*Bureau of Mines. †Includes 4,375,000 bbl. in California.

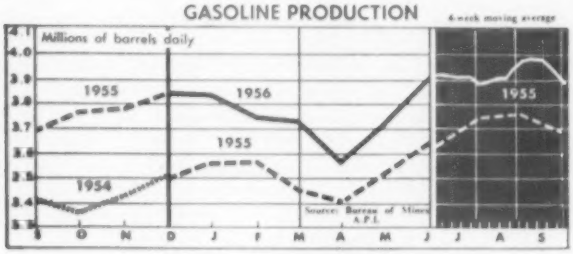
REFINERY RUNS



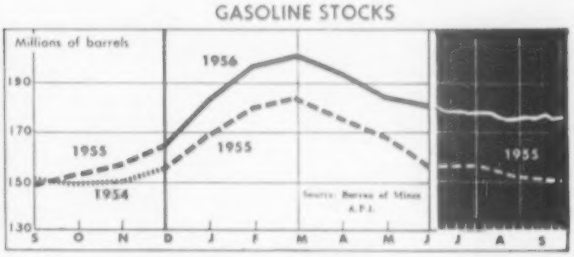
FOUR-PRODUCT STOCKS



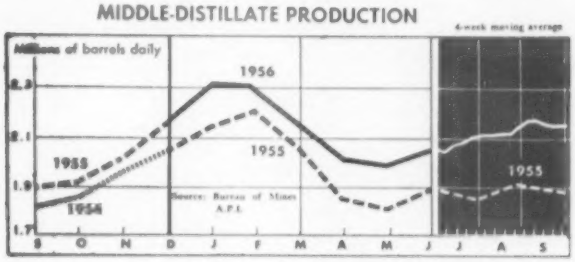
GASOLINE PRODUCTION



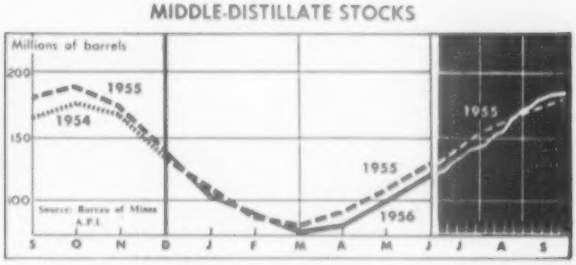
GASOLINE STOCKS



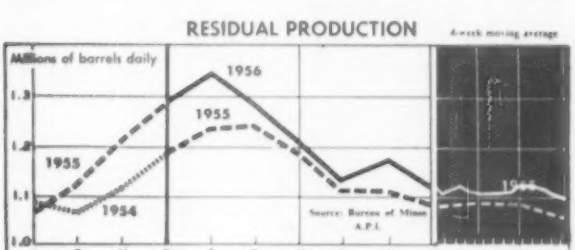
MIDDLE-DISTILLATE PRODUCTION



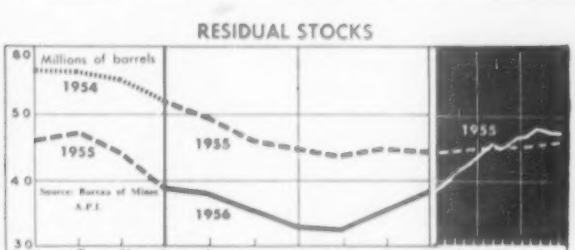
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, OCTOBER 5, 1956

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1956—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,040	504.0	17.4	322.0	194.4	43,487	12,563	54,501	11,851	1,054	452.1	31.9	254.5	201.8
Appalachian:														
District 1	106	46.6	4.7	29.0	4.7	4,621	568	3,385	469	100	42.0	4.7	19.7	7.1
District 2	100	48.9	7.4	14.6	13.9	2,843	763	1,021	449	98	48.2	5.4	12.4	13.5
Ind., Ill., Ky.	1,424	716.6	70.9	297.7	174.6	30,986	7,394	23,683	5,631	1,357	754.7	57.9	258.0	177.1
Minn., Wis., Dak.	82	42.1	6.1	18.9	5.0	6,354	1,791	8,193	143	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	645	376.1	7.4	168.4	32.4	14,683	1,968	13,616	1,483	656	391.1	12.2	163.0	19.4
Inland Texas	248	199.1	6.1	43.4	22.4	7,570	576	2,066	1,754	243	192.8	8.7	49.6	23.2
Texas Gulf Coast	1,873	895.3	115.0	527.9	249.6	24,280	3,987	18,152	7,058	1,813	866.5	113.0	450.9	230.7
La. Gulf Coast	678	343.4	53.0	193.4	49.3	9,556	2,292	7,515	1,757	684	349.3	58.8	162.0	43.2
N. La. and Ark.	99	42.0	8.4	24.3	5.1	4,769	503	2,317	244	90	33.3	7.9	22.1	6.2
Rocky Mountain:														
New Mexico	22	12.1	0.3	4.4	2.7	438	8	121	49	22	11.7	0.4	4.0	2.9
Other Rocky Mtn.	255	117.9	2.6	58.0	28.0	4,994	487	3,266	828	240	115.4	2.6	58.2	36.7
West Coast	1,125	468.3		336.3	320.4	21,419	343	13,969	15,583	1,108	508.8	5.1	158.0	361.5
Oct. 5, 1956	7,697	3,812.4	299.4	1,895.4	1,102.6	176,000	33,243	151,805	47,299	7,465	3,765.9	308.6	1,612.4	1,123.3
Sept. 28, 1956	¶7,912	3,870.4	354.9	1,820.6	1,088.9	174,720	33,817	150,367	47,499					
Oct. 7, 1955	7,191	3,621.9	295.1	1,495.4	1,101.7	151,006	36,355	145,598	47,021					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Included in Indiana, Illinois, Kentucky. ¶Revised.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	11.25-11.75
Premium (96 octane)	13.00-13.50
Gulf Coast (cargoes for coastwise or export movement):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California—Los Angeles (rack):	
Regular (84 octane)	12.1-12.6
Premium (93 octane)	13.35
Premium (96 octane)	14.3-14.6
Caribbean area (cargoes):	
Regular (87 octane)	10.50
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	5.0
Breckenridge:	
Grade 26-70	4.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.75-10.00
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	8.75-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	9.5
Distillate No. 2	8.75
New York Harbor (barges):	
Kerosine 41-43	11.25
★ Distillate No. 2	10.65
★ Diesel fuel, 48-52 d.i.	10.95
Caribbean area (cargoes):	
Distillate No. 2	8.75

WAX (I.B.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.00-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.80
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.15-2.25

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
200 vis. neutral (180 at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.02				
15-15.9	2.08				
16-16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$3.01	2.45	
25-25.9	2.64	2.60	3.03	2.47	$2.13
26-26.9	2.69	2.62	3.05	2.49	2.19
27-27.9	2.76	2.64	3.07	2.51	2.24
28-28.9	2.83	2.66	3.09	2.53	2.29
29-29.9	2.91	2.68	3.11	2.55	2.34
30-30.9	2.97	2.70	3.13	2.57	2.39
31-31.9	3.04	2.72		2.59	2.44
32-32.9	3.12	2.74		2.61	2.48
33-33.9	3.20	2.76		2.63	2.52
34-34.9	3.27	2.78		2.65	2.56
35-35.9	3.34	2.80		2.67	2.60
36-36.9	3.39	2.82		2.69	2.64
37-37.9		2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, August 16, 1956.

Some crudes in North Central Texas, West Central Texas, and Texas Panhandle have been shifted to the intermediate schedule with $2.83 for 40° and 2 cents per degree drop. Effective dates range from July 15, 1956, to August 10, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.68
Middle District	4.50
Southwest Pennsylvania	4.21
West Virginia	4.03
Buckeye Grade	4.07
Zanesville Grade	3.15
Illinois Basin	**2.90**
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.8°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	$2.80
Tia Juana medium, 26.5°-26.9°, Amuay§	†2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

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(Latest reported spot fixtures)

★ Gulf-U.S.N.H., dirty (USMC+50%)	$4.28
★ N.W.I.-U.S.N.H., dirty (USMC+50%)	4.05
N.W.I.-U.K., dirty (Scale+105%) (66s. 8d.)	9.29
★ P.G.-U.K., dirty (Scale+140%) (129s. 10d.)	18.09
★ P.G.-France, dirty (USMC+57.5%)	17.17

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GAS COMPRESSORS—3 Bessemer type 10 twins direct connected units—Boswell-Frates Company, 1003 Kennedy Building, Tulsa, Oklahoma.

U-15 DRAWWORKS, Ser. #458, with three NKU Waukesha engines and dual 15" Hydromatic Brake. Drawworks five years old. IVERSON SUPPLY COMPANY, Kermit, Texas. Phone 3491.

CARDWELL 1459K two drum Model R Spudder with 55 ft. new single leg mast on skids with roof and walks. Price $11,000.00 F.O.B., Wichita, Kansas. Cardwell Investment Company, Inc., 604 Petroleum Building.

20" PIPE FOR SALE. 20,000 feet, 5/16" wall, good, used, plain end, single random lengths, line pipe. Contact: The Tri-State Pipe Company, P. O. Box 542, Bellaire, Ohio. Phone: Bellaire 42.

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8—Hi-vol pumps, 10 x 7 x 18e 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.
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10—Kellogg Adm. Fltg. Hd. 2700, 2200, 1800 Sq. Ft.
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127' TYPE B OIL WELL Jackknife Derrick with five-sheave crown, 10' x 42' x 24' Split Type Sub-Structure, steel flooring. Price, $7,500. IVERSON SUPPLY COMPANY, Kermit, Texas. Phone 3491.

ELI DRILL M6D-160D on 1953 Ford F-750. Combination air and 4½ x 5 GD Pump. Excellent Condition. $10,000. ELI Drill M6T5-209 on 1952 2½ Ton Dodge. 6x6 Wheatley Pump. Excellent Condition. $7,500. Drills may be seen at 61st Street and Elwood, Tulsa, Oklahoma. SeisDrill, Inc., 515 Thompson Bldg., Tulsa, Oklahoma.

1 EC CARDWELL DRAWWORKS with practically new 2 engine chain compound. Drum has new flanges and brake lining and new 1⅛ Lebus groove. 4 speed transmission completely overhauled. Air control on drum & rotary. Foster spinning cathead. Skids for 2 WAK Waukesha engines. This drawworks located at Drilco Shop, Snyder, Texas. Price $3500.00. Claude J. Thompson, Inc., 1365 Leggett Drive, Abilene, Texas. Telephone ORchard 3-3203.

EQUIPMENT WANTED

WILL BUY FOR CASH—One complete Slim Hole Portable Drilling Rig, Diesel Power, capable of drilling slim hole to 8,000 ft. Prefer location Northern United States with equipment winterized. Box J-746, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT TO BUY—2500 to 3000-ft. rotary rig, drill pipe, pump, etc. Cash; no trade. Keith Morton, Conrad, Montana.

WANTED TO PURCHASE

50 to 1000 10" 8V Tapered thread line pipe couplings. Advise price and condition.

HANSON'S PUMP AND MACHINE WORKS, INC.
2310 W. McDowell Rd., Phoenix, Ariz.

FOR SALE EQUIPMENT

LIQUIDATION

TIDEWATER OIL REFINERY

DRUMRIGHT, OKLA.

MODERN—COMPLETE 15000 BBL. PER DAY PLANT

MAY BE PURCHASED AS:

(1) COMPLETE FOR OPERATION AT PRESENT LOCATION
(2) INDIVIDUAL UNITS OR COMPONENTS FOR REMOVAL
(3) INDIVIDUAL PIECES FOR REMOVAL

SOME OF EQUIPMENT HIGHLIGHTS IN PLANT:

- HOUDRIFLOW CATALYTIC CRACKING UNIT (Installed new in 1952)
- VACUUM CRUDE OIL DISTILLATION UNIT (Installed new in 1953)
- 2,500,000 BBL. STORAGE TANKS—FROM 500 TO 100,000 BBLS.
- (6) 30,000 GAL. PROPANE TANKS
- (2) 10,000 BBL. HORTONSPHERES
- 5000 TON PIPE, VALVES & FITTINGS
- (15) STRUCTURAL STEEL BUILDINGS
- COMPLETE LABORATORY
- ETHYL BLENDING PLANT
- LOADING RACKS
- COOLING TOWERS
- POLYMERIZATION PLANT
- MACHINE SHOP, NEW WAREHOUSE SUPPLIES

(CATALOG BEING PREPARED—WRITE FOR YOUR COPY)

HEAT & POWER CO., INC.

New York Office
60 East 42nd Street
New York 17, N. Y.
Phone: Murray Hill 7-5280

Tulsa Office
310 Thompson Bldg.
Tulsa 3, Okla.
Phone: Diamond 3-4890

HELP WANTED

CHEMICAL ENGINEER for Independent Natural Gasoline Company located in the Permian Basin of West Texas. Prefer recent graduate with BS in chemical engineering. experience not necessary. Reply to Box J-769, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR ENGINEER and GEOLOGIST

For Independent in Canadian Operations. Both to be located in Calgary, Alta., Canada. Reply:

BOX J-733,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

ENGINEERS

Are you worth up to

$10,000 A YEAR?

Important permanent positions, paying from $6,500 to $10,000 a year with unusual future opportunity, have been created by the expansion program of our large, long-established engineering and construction firm. We need qualified engineers, designers and draftsmen experienced in structural, concrete, mechanical and piping design. Engineering offices are in several major American cities and Canada. Excellent working conditions. Generous company benefits. Our employees know of this ad.

Investigate this opportunity. Write today giving age, education and experience. Your inquiry will be kept strictly confidential and will be answered promptly.

Box J-739,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

WANTED: Recently graduated electrical, civil or mechanical engineer or engineer with a few years experience needed for office and field work in pipe line division of major oil company in Middle West. Please state age, experience and educational qualifications. Box J-772, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS

Chemical, Mechanical, Petroleum, Gas Engineering Graduates. Our company will interview applicants for openings in our natural gas-gasoline department in Mid-Continent, Louisiana, Gulf Coast areas. Two years minimum design and/or operation experience. Salary to suit qualifications. Our employees are aware of this ad. Box J-721, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRONIC ENGINEER

Immediate opening for recent college graduate, preferably with some experience in design and application of electronic equipment. Objective is the application of automation and remote control to present pipe line and distribution facilities, and the design, cost estimates, and installation of new facilities.

Progressive company, located in Southwest, providing liberal stock plan, retirement plan, group hospital and life insurance plan and other attractive benefits. Send resume of education, experience, and salary requirements to

Box J-775,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

PROCESSING ENGINEER: Outstanding opportunity for qualified man to assume processing engineering of moderate size complete refinery. Must have proven supervisory ability and experience with modern processing, organization and economics necessary. Preferred age 35-45. Company is stable and aggressive with unusually good prospects. Location in developing area with agreeable living conditions. Salary and other terms of employment offer a highly profitable career to right man. Must have college education and at least ten years' experience in latest type refining units. All replies will be held confidential and no obligation will be incurred by applicant. For full particulars write to Box J-763, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR ENGINEER and GEOLOGIST

For Independent In Mid-Continent Area. Both to be located in Oklahoma City. Reply:

BOX J-734,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

Opportunity for Division Sales Engineer

For promotional and development sales in the Gulf Coast area with a leading manufacturer of oil well drilling and producing equipment. Products involved are derricks, substructures and related equipment for off shore operation. Splendid opportunity for advancement. Salary commensurate with experience. Replies should include resume of education and experience, as well as salary requirements. Replies will be held in confidence.

BOX J-738,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

VALUATION ENGINEER

Petroleum Engineer with experience in appraisal and reservoir work wanted by permanently established independent oil company. Position requires practical as well as technical knowledge in the evaluation and financing of producing property purchases, and in administrative procedure. Must have the ability and initiative to develop necessary contacts in the active regions of the oil country. Reply should state age, education, experience, active references, and starting salary required.

BOX J-690,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

BECHTEL

SAN FRANCISCO CALIFORNIA

Offers engineers liberal relocation allowances from the point of employment to the engineering office in San Francisco. These allowances include transportation for you and your family plus moving allowances for your household furnishings.

PIPELINE ENGINEERS
SENIOR ELECTRICAL
SENIOR MECHANICAL

San Francisco opportunity for senior electrical or mechanical engineers with experience on oil pipeline and pumping stations or gas pipeline and compressor stations.

Send resume to Manager of Employment & Placement
Industrial Relations Division

BECHTEL CORPORATION
220 Bush Street
San Francisco 4, Calif.

For an immediate personal interview you may phone:

Paul Keating, PLaza 7-4400, New York City
Joe Braddick, FAirfax 3-2401, Houston, Texas
Bill Milligan, TUcker 1549, Los Angeles, Calif.
Don Palmer, DOuglas 2-4032, San Francisco, Calif.

NORTHERN CALIFORNIA
REFINERY PROCESS ENGINEER

Combine challenging, unlimited-future job with ideal, smog-free living in San Francisco-Oakland Bay Area. Excellent salary, moving allowance, profit sharing plan and retirement, family plan hospitalization and life insurance. Must have B.S. or M.S. in chemical engineering, plus at least 10 years experience in process design with major oil company or refinery builder. Forward complete resume giving experience and salary requirement. Strictest confidence.

ALSO OPENINGS FOR REFINERY DESIGNERS AND ESTIMATORS

KAISER ENGINEERS
Division of Henry J. Kaiser Co., Dept. RZ,
1924 Broadway, Oakland 12, California,
TWinoaks 3-4600

HELP WANTED

HYDRAULIC CASING pulling unit operators and helpers. Call GLadstone 3-4551, Great Bend, Kansas.

PETROLEUM ENGINEER with about two years experience wanted by major oil company for training in oil reserve and valuation work. Permanent Tulsa location with opportunity for advancement. Replies should furnish complete personal data, education, experience and salary requirements. Box J-765, The Oil and Gas Journal, Tulsa, Oklahoma.

OPERATIONS ENGINEER

Growing independent oil company wants petroleum engineer with three to six years of practical, technical, and administrative experience for position in operations planning and control section. Some knowledge of valuation work and oil and gas law would also be helpful. Reply should furnish details on education, experience, and references, and state age and required starting salary.

BOX J-784,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

RIG MECHANICS
DRILLERS

FOR FOREIGN EMPLOYMENT

Large company operating in Egypt has openings for experienced rig mechanics and drillers. Write giving age, marital status, education, experience and telephone number.

Attention of SHROGJ

Sahara Petroleum Co.

625 MADISON AVENUE
NEW YORK 22, NEW YORK

PARTY CHIEFS
SEISMOLOGISTS
COMPUTERS
OBSERVERS

WORLD-WIDE SEISMOGRAPH
CONTRACTING ORGANIZATION

offers technical careers to qualified experienced applicants. Highly attractive starting salaries with good opportunities for advancement within both domestic and foreign areas.

United Geophysical Corporation

POST OFFICE BOX "M"
PASADENA, CALIFORNIA

CHEMICAL—or—
MECHANICAL ENGINEER

Age Under 35. Petroleum Refinery Exp. Desirable.

Technical work in small expanding department of a MAJOR OIL CO. New York City location with some travel entailed.

Excellent opportunity for man with initiative. Salary commensurate with experience. Fine employee benefit program.

Send full qualifications together with resume to

Box J-745,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

FOREIGN DOMESTIC EMPLOYMENT List oil companies, drilling contractors, showing where apply foreign jobs $5.00 cash. List 100 large domestic oil companies $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

SALES REPRESENTATIVE. Oil field drills and equipment. Must have broad knowledge of petroleum exploration and oil field drilling equipment. Oklahoma, Kansas, Arkansas and Texas Panhandle territory. Salary plus bonus and expenses. Write Box J-742, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

OIL INDUSTRY Employment Service, 405 Tuloma Bldg., Tulsa, Okla., GI 7-5974, Tom Robinson, owner. For graduate, experienced engineers under 35.

ENGINEERS WANTED—Oil well drilling tool manufacturer has opening for Design or Field Engineers familiar with rock bits. Should have technical education with some experience preferred. Excellent opportunity in an expanding Engineering Department. Write giving details of education and previous experience to Chicago Pneumatic Tool Company, Box 1990, Fort Worth, Texas.

Graduate Petroleum Engineers with 2 years or more experience wanted by the Production Department of a major oil company. Openings available in Rocky Mountain and Mid-Continent areas. In first reply please give resume of experience and date available.

Box J-753, The Oil and Gas Journal,
Tulsa, Oklahoma.

WANTED

Experienced Refinery Personnel For Baghdad, Iraq

For work in a modern, complete refinery operation

Three year extendable contract with provisions for:

- Liberal monthly paid salaries and living allowance
- Completely furnished air-cooled private modern house with utilities
- All essential local transportation including school needs
- Accredited American and British schools available
- First class air transportation Iraq and return for entire family
- Liberal excess baggage and freight allowances
- Medical and insurance benefits to employees. Good hospitals.
- Annual 30-day vacations with pay and allowances
- Our fee paid

• NO INCOME TAX

Applications solicited on confidential basis for following posts:

LIGHT OIL DIVISION

Shift Foreman
Pipefittter Foreman
Yard and Cleanout (Rigger) Foreman
Process Engineers, Light Oil
Shop Foreman
Pump and Engine Foreman
Shift Operators, Light Oil

LUBE OIL DIVISION

General Superintendent, Lube Operations
Chief Chemist and Coordinator
LPGas Engineer, Production and Distribution
Assistant Chief Accountant for Lube Oil Operations
Lube Process Engineers
Engine Test Engineer and Assistant
Shift Foremen, Lube Operations
Shift Operators for Vacuum Distillation
Shift Operators for Propane Deasphalting, Asphalt Blowing
Shift Operators for Furfural Treating
Shift Operators for Propane Dewaxing
Shift Operators for Clay Percolation and Acid Treatment
Foreman, Compounding Blending, Filling
Foremen, Can and Drum Making
Foreman, Asphalt Blending and Filling
Boardmen (Centralmen) for Vacuum Distillation
Boardmen (Centralmen) for Propane Deasphalting, Asphalt Blowing
Boardmen (Centralmen) for Furfural Treating
Assistant Operators, Propane Dewaxing
Pump and Engine Sub-Foreman
Pipefitter Sub Foreman
General Sub-Foreman, Labor and Miscellaneous Crafts
Instrument Supervisors

• MARRIED MEN PREFERRED • AGE OPEN

In most job categories, services are estimated to begin in Baghdad After Christmas, 1956

Please send complete resume of background experience to:

OVERSEAS EMPLOYMENT SECTION

CHAS. J. LOVELESS PERSONNEL SERVICE

616 South Main Street, Tulsa, Oklahoma
Cable: LOPESE Telephone Gibson 7-3193

HELP WANTED

NATURAL GAS ENGINEER with engineering degree plus experience in plant design or operation. Location Tulsa. Amerada Petroleum Corporation. Gas Department P. O. Box 2040, Tulsa, Oklahoma.

CORROSION ENGINEER

Experienced or interested in cathodic protection of bare and coated pipelines. Immediate location in Indiana or Ohio. Salary commensurate with training and experience. Outstanding benefit programs. Unusual opportunities for well-qualified men. Give full particulars regarding education, experience, salary requirements and photograph. Replies held in strictest confidence. Write to

WILLIAM H. WEBER

Sohio Pipe Line Company

7438 Forsyth
St. Louis 5, Missouri

PETROLEUM ENGINEERS

Major Oil Company has openings in Production Dept. in Venezuela for a number of graduate petroleum engineers.

OPENINGS also for petroleum, mechanical and chemical engineers for work in drilling, pipeline and gas depts. Salary commensurate with experience.

Please send details of Experience to:
P. O. BOX NO. 35
BOWLING GREEN STATION
NEW YORK 4, N. Y.

HELP WANTED

PRODUCTION ENGINEER—For responsible position with large Independent Company operating primarily in Kansas and Oklahoma. Five to ten years experience to qualify. State qualifications and give salary requirements. Box J-747, The Oil and Gas Journal, Tulsa, Oklahoma.

STAFF ENGINEER
MAINTENANCE SERVICES
Foreign Employment

To assist and advise operating management on all maintenance services and practices in major oil installation located in Saudi Arabia.

Must be graduate engineer with minimum of 10 years' planning and operations experience in heavy industrial and refinery installations. Proven supervisory ability and thorough knowledge of maintenance craft methods and equipment required. Minimum salary $1000 monthly plus allowances and generous benefits. Excellent promotional opportunities.

Write outlining personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 182

ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, NEW YORK

MAINTENANCE and PLANNING ENGINEERS needed in CARIBBEAN AREA

Attractive staff positions are available with affiliate of STANDARD OIL COMPANY (N.J.) for qualified Mechanical and Industrial Engineering graduates—

MAINTENANCE ENGINEERING—studies, surveys, economics, trouble shooting to improve mechanical work efficiency, new equipment evaluation, standards, mechanical work systems and procedures.

PLANNING ENGINEERING—short, intermediate and long-range planning and follow up of mechanical work force for maintenance and construction work, contract preparation and follow up, coordination of all manpower planning activities.

Liberal salaries, benefit plans and vacation policy.

— WRITE —

Giving age, complete address, marital status, education and details of previous experience to:

Box 308 L, Radio City Station,
New York 19, N. Y.

. . . . MECHANIC . . . .
HEAVY DUTY

MAJOR OIL COMPANY HAS OPENING IN VENEZUELA FOR HEAVY DUTY MECHANIC EXPERIENCED IN OPERATION & MAINTENANCE OF NATURAL GAS OR DIESEL ENGINES OF 800 HP OR BETTER EMPLOYED IN CRUDE OIL PIPELINE SERVICE. AGE TO 40 YEARS.

PLEASE SEND DETAILS OF EXPERIENCE

P. O. BOX #35
BOWLING GREEN STATION
NEW YORK 4, N. Y.

HELP WANTED

RESERVOIR ENGINEER. Two to Three years experience. Work to include reserves, evaluations and water flood studies. Substantial independent company. Location Tulsa. Write Box J-766, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN

Company pays your and family's transportation and our fee. No income tax if complete two-year contract. Positions available for Engineers, Geologists, Foremen, Supervisors, Drillers, and many others. Send age, education, marital status, and experience to American Employment Service, 1004 Houston, Fort Worth, Texas. For listing of individual positions see classified section of Sunday's Fort Worth Star-Telegram.

DITCHER SALES Promotion Manager Wanted: Experienced man to head sales promotional activity of leading manufacturer of expanding ditcher line. Must have sales experience and be familiar with design and application of both wheel and boom type machines. Position involves overall sales management responsibilities with distributors and key customer contacts. Age preferably under 45. Management level compensation. Provide complete experience resume with application. Reply to: Personnel Director, Barber-Greene Company, Aurora, Illinois.

PIPELINE ECONOMIC STUDIES

MAJOR CONSULTING ENGINEERING COMPANY
requires
Management Type Man for Developing Economic and Feasibility Reports on Pipeline Systems.

Address:

Box J-743,
The Oil and Gas Journal,
Tulsa, Oklahoma.

OPPORTUNITY

Supervisory research opening in Lion Oil, A Division of Monsanto Chemical Company for qualified person with at least 5 years experience in the formulation of petroleum specialties. Refining experience desirable but not essential. Location in El Dorado, Arkansas. Integrated refinery operations of moderate size. Real opportunity for advancement.

Address replies to:

E. R. COLEY
Technical Recruitment Coordinator
Lion Oil Company, A Division of Monsanto Chemical Company
El Dorado, Arkansas

SITUATIONS WANTED

GEOLOGIST and stratigrapher with over 15 years varied experience desires permanent position in Rocky Mountain, Mid-Continent or Illinois Basin areas. Box J-770, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Position as Purchasing Agent. Prefer oil company in Dallas. Fifteen years oil company experience. Will furnish references. Box J-771, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 28, 3½ years varied surface and subsurface experience, desires challenging petroleum geology position. Prefer base in one of the larger cities. Box J-729, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST - GEOPHYSICIST FOR FOREIGN EMPLOYMENT

Age, 32. Eight years diversified, well-rounded exploration experience, including logistics, with U. S. oil company operating overseas. Good record. Currently employed. Possibly interested in employment with aggressive domestic oil company planning future foreign activity.

Box J-767, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PETROLEUM ENGINEER, M.S., Currently engaged in Oil Property Evaluations, extensive secondary recovery and reservoir background, seeks responsible position in Mid-Continent or Rocky Mountain regions. Box J-774, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER, 33, registered. Eight years diversified natural gas experience including economic development, process design, and operation. Supervisory experience. Desires responsible position in expanding enterprise. Box J-768, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE CHEMICAL ENGINEER. With refinery, natural gas, economics and transmission experience desires challenging position. Box J-744, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMIC Reflection Interpretation Specialist desires change, better pay. Age 39, B.S. Geology, good Spanish, married status. Ten years Venezuela, four years U. S. and three years Mexico. Twelve years supervisory capacity with seismic contractors. Wants position Venezuela or elsewhere in Latin America as oil company geophysicist, or division manager or chief geophysicist of seismic contracting firm. Box J-756, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY MANAGER or Superintendent: For complete refinery operations, also to lubricants, oils, waxes, asphalts, seeks management operations position. Experienced Chemical Engineer, in refinery processings, degree, registered, Economics, good leadership, foreign or domestic. Top references. Box J-762, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION WANTED

$30,000,000 TO INVEST in producing Oil Properties. If priced reasonable send full report. TJADEN, Eagle Lake, Texas.

WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

SERVICES

ASPHALT AND Lubricating Oil Consultant.—Refinery design and operations. Development Methods. Lubrication; Specialty Products. Asphalt Technology. Highway Engineering. E. J. Barth, 54 West Street, Northampton, Mass.

SCOUTING

VENEZUELAN OIL SCOUTING AGENCY
Reports—maps—newsletter
Cable: VOSA, Caracas
Mail: Apartado 2061
N. VanMiddlesworth
Phone: 54 48 82

ELECTRIC LOG CABINETS

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer cabinet. Two compartments to each drawer with separate follow blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for new Catalog 1156-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Okla.

WANTED

WANTED—AIME transactions from the year 1945. If necessary, will buy complete set, new or used. Please contact either Mr. Osborne or Mr. Casey, Nortex Oil & Gas Corp., Life of America Building, Dallas, Texas.

WILL BUY
OIL PRODUCING PROPERTIES
Box J-726,
The Oil and Gas Journal
Tulsa, Oklahoma.

ROYALTIES

HIGHEST PRICES PAID for choice oil and gas income royalties, overrides, oil properties. A. S. Berry, P. O. Box 1383, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

ONE-HALF INTEREST in 80 acre lease and well drilled through sand, $2000.00. New wells on offset acreage. L. Price, Coweta, Okla.

2,000 ACRES one parcel-5 year leases $1.00 annual rentals. No overrides. Western Edmonson Co., Ky. Price $2.00 per acre. Box J-773, The Oil and Gas Journal, Tulsa, Oklahoma.

160 ACRE Utah Oil Lease. Bargain, on structure near gas wells. Owner: R. Barnsley, 950 Lincoln Ave., Palo Alto, Calif.

SACRIFICE SALE: Water flood equipment, new with 6 wells, tanks, pumps, lines, etc., and 800 acres lease all for $11,500. Near Chanute, Kansas. (Owner) P. O. Box 2, Chanute, Ph. 1215. 1st. come, 1st. served.

CONTACT A. L. BOWLES, Box 947, Ada, Okla., for attractive drilling deal in Seminole Co., Okla., or will drill well selling ¼ to ½ interest.

UTAH. Leases on U. S. lands in areas of leasing and drilling activity. We have the sections selected and file your signed applications for you. 640 acres minimum lease. Read letters from clients who made big profits from our selections. You pay U. S. rents and pay us a service fee. John L. Donahue, 430—16th Street, Denver 2, Colorado. Phone ALpine 5-1067.

North Chaves County, N. M.
One field recommended already important discovery. Other major area to drill. Lease or Royalty interests at low cost in either field offer great potential value. Data on request.
W. J. PETERMAN, Geologist
Exploration 1918-1956 Engineering
Portales New Mexico

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

BUSINESS OPPORTUNITIES

LOOKING FOR OIL WELL items for distribution in West Texas and New Mexico. Personnel qualified in production items for area. Will expand sales force if necessary. Warehousing available in Odessa. Will furnish references. P. O. Box 897, Midland, Texas.

ESTABLISHED INDEPENDENT oil firm desires acreage within known geological structures. Straight leases or drilling deals considered. Submit full information to Box J-752, The Oil and Gas Journal, Tulsa, Oklahoma.

FINANCIAL CONTACTS. Underwriters, Brokers, Private Finders of Capital reached. No shopping. Confidential. FREE ENTERPRISE ASSOCIATES 817—51st St., Brooklyn, N. Y.

WANT YOU to help me drill for Oil on 80 acres between two pools noted for their big wells. My Map and printed discussion will convince you that this offers a good chance for big production. ¾ interest $4800.00, ½ interest $3200.00, ¼ interest $1600.00, ⅛ interest $800.00, 1/16 interest $400.00 and 1/32 interest $200.00. Write O. A. Sewell, Box 103, Coweta, Oklahoma.

NEW INVENTION
Petroleum product formula with patented trademark. Removes big heavy-duty tire, no matter how badly vulcanized to rim with road tar and dirt, in minutes instead of hours. Will also easily clean rims of passenger tubeless tires. Used successfully locally. For sale. For terms write
MIKE SASLOW,
4023 Jay Street,
Sacramento, California.

Equipment Men

Berry Opens Williston Basin Warehouse for B & W

W. D. (Ted) Berry, field representative for B & W, Inc., has been transferred from South Texas to Williston, N. D., and will open a B & W warehouse to provide delivery and field service in the Williston basin. B & W, Inc., manufactures a complete line of primary cementing tools for the petroleum industry.

Longhorn Supply Names Cummings to Houston Sales

Oscar S. Cummings has been appointed to the city sales organization of Longhorn Supply Co., Houston, G. W. Hunt, partner in the firm, has announced.

Cummings was purchasing agent for Houston Oil Co. of Texas prior to its recent acquisition by Atlantic Refining Co. He had been with Houston Oil and its subsidiaries, Houston Pipe Line Co. and Southwestern Settlement & Development Corp., for 30 years and had served as purchasing agent for over 20 years.

BJ Oil Tools Completes Houston Warehouse

Byron Jackson Oil Tools, Inc., has completed construction of a new warehouse in Houston, it is announced by Garth Nicolson, vice president and general manager. The expansion supplements the company's Houston manufacturing plant and offices.

Included in the expanded facilities are offices, a warehouse containing 10,000 sq. ft. of storage space, and a 1,000-sq.-ft. loading dock.

Electro-Technical Labs Begins Office and Plant

D. D. Mize, vice president and general manager of Electro-Technical Labs, Houston, has announced that construction has begun on a $335,000 building for new quarters. The two-story office, containing 13,375 sq. ft., and the one-story plant of 16,750 sq. ft., housing the assembly and machine shops, are located on a three-acre tract.

Electro-Technical Labs manufactures and markets a complete line of geophysical instruments used primarily in oil-exploration activity. Sales outside the United States are made through its foreign agent, Electro-Tech International.

Stewart & Stevenson Expands in Three Plants

An expansion program in Houston by Stewart & Stevenson Services, Inc., includes a new steel building wing that raises total square footage at its main plant to 115,000, Joe Manning, Stewart & Stevenson general manager, has announced. The new structure includes a 30-ton crane which enables the company to meet demand for its Rigelectric drilling-rig power equipment and other high-horsepower equipment. The crane and other equipment is used in generator-driven engines and pumps up to 2,000 hp.

Expansions also have been effected by Stewart & Stevenson at Corpus Christi and Dallas. Floor space at the plants in both cities has been doubled in the parts and service depots. New facilities at Dallas and Corpus Christi include a dynamometer for testing remanufactured engines.

In all three cities, Stewart & Stevenson's facilities have been speeded up to overhaul and repair General Motors diesels, Climax, and Chrysler industrial engines.

Bradford Appoints in Texas and Illinois Areas

Gene Easley, field representative of Eldorado, Ill., has been advanced to branch manager of the Greenville, Ky., store of Bradford Supply Co.; F. L. (Pat) Masters, formerly a field representative at Eldorado, has been named branch manager at Princeton, Ind.; and D. T. (Tommy) Byrne, petroleum engineer, has been transferred from Oil Springs, Ky., to the company's Texas district where he will be assistant engineer under R. G. Ricards, chief engineer.

Both Easley and Masters are in the Illinois division headed by C. D. Chamblin.

Byrne was formerly with the production research laboratory of the Pennsylvania Grade Crude Oil Association at Bradford engaged in waterflooding research. He will be located at the Wichita Falls headquarters of the Texas division which is headed by J. T. Hayes.

A. O. Smith Names Meter Products Sales Manager

H. D. Leisenring has been appointed general sales manager of A. O. Smith Corp.'s meter products division, located at the company's Pacific Coast works in Los Angeles. Previously he was sales manager in the East Coast area, responsible for merchandising petroleum meters and gasoline dispensers.

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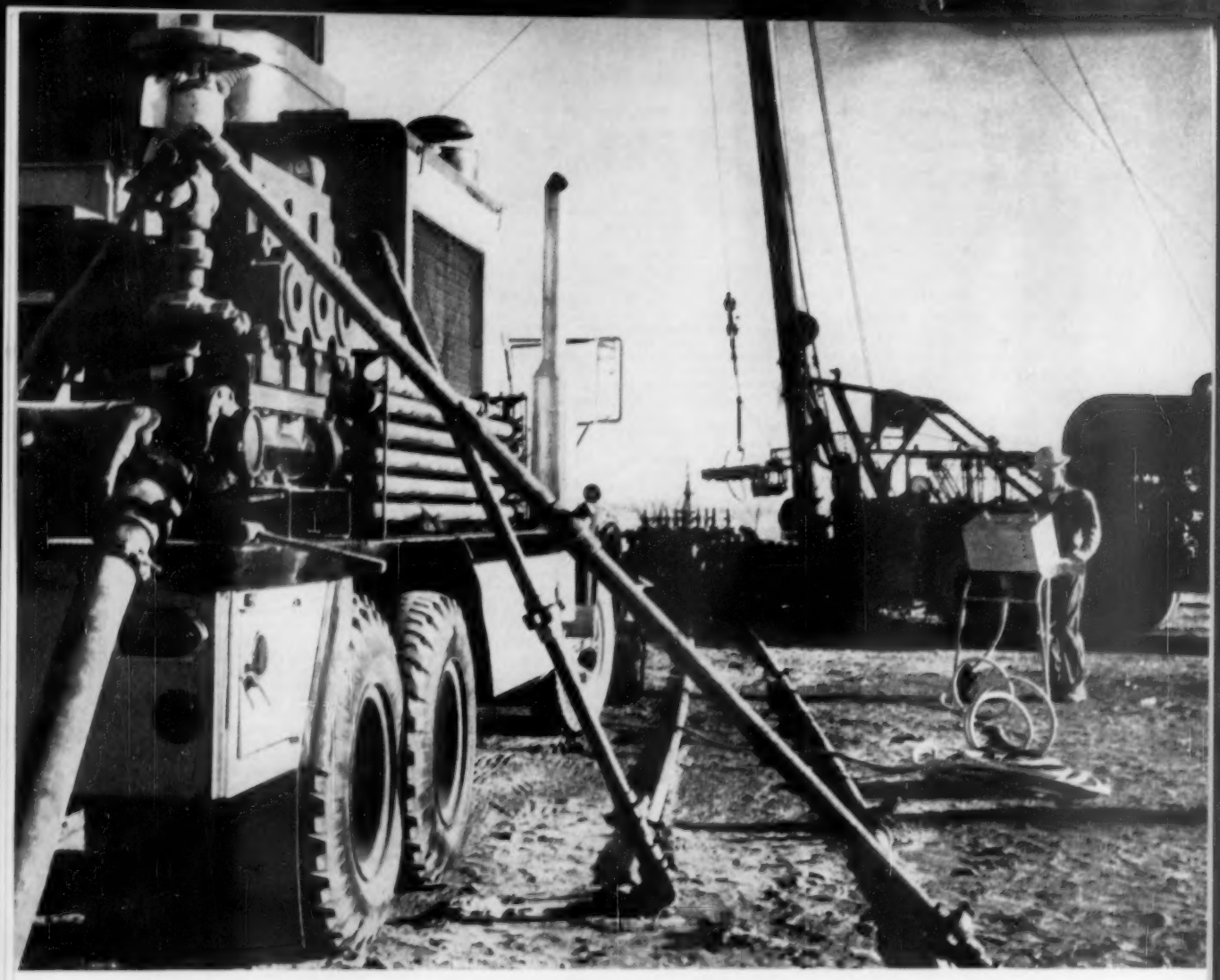
Aero Design and Engineering Company 43
AiResearch Industrial Division of the Garrett Corporation 31
Aldrich Pump Company, The 66
Allis-Chalmers Mfg. Co. 23
American Cable Division of American Chain & Cable 16
American Cyanamid Company, Refinery Chemicals Department 50
American Iron & Machine Works Co. Back Cover
Atlas Powder Company, Aquaness Department 19
Axelson Manufacturing Company, A Division of U. S. Industries, Inc. 165, 166, 167, 168, 199
BJ Service, Inc. 210
Baird Mfg. Co. 211
Baker Oil Tools, Inc. 60
Bank of Montreal, The 203
Black, Sivalls & Bryson, Inc. 192, 193
British Petroleum Company, Limited, The 194
Cabot Shops, Inc. 58
Central Scientific Company 135
Chapman Valve Mfg. Co., The 17
Chicago Bridge & Iron Company 97
Chiksan Company 51
Clark Bros. Co. One of the Dresser Industries 39
Classified Advertising 221, 222, 223, 224, 225, 226
Cleveland Trencher Company, The 163
Coates Field Service, Inc. 157
Continental Supply Co., The 45
Cooper, Inc., Fred E. 196, 197
Core Laboratories, Inc. 184
Crose Manufacturing Co., Inc., M. J. 159
Darling Valve and Mfg. Co. 68
De Laval Steam Turbine Co. 62
DeZurik Shower Company 71
Dowell Incorporated 153, 228
Dresser Industries, Inc. 142, 143
Dresser Manufacturing Division 72
Drilling & Service, Inc. 191
Drilling Equipment Mfg. Co. 201
Drive-Thru Gate Co., The 173
du Pont 55, 56
Edward Valves, Inc. 151
Elliott Company 98
Emsco Manufacturing Company D+B Division 45
Enardo Manufacturing Company 162
Fairbanks, Morse & Co. 4
First National Bank of Shreveport, The 173
Fish Engineering Corporation, Manufacturing Division 146
Flexitallic Gasket Company 161
Flint Steel Corporation 198
Floridin Company 171
Foster Cathead Company 211
Franks Division Cabot Shops, Inc. Inside Back Cover
Fulton & Company, R. H. 154
Gardner-Denver Company 28, 29
Garrett Corporation, AiResearch Industrial Division 31
General American Transportation Corporation 78
Geophysical Service, Inc. 205
Globe Oil Tools Company 150
Goodrich Chemical Company, B. F. 5
Gott Mfg. Co., H. P. 161
Grancell, I. H. 151
Grove Valve and Regulator Company 26
Guiberson Corporation 141
Gulf Oil Corporation 22
H & M Pipe Beveling Machine Co. 172
Halliburton Oil Well Cementing Co. 15, 188, 189
Hammond Iron Works 10
Hawkeye Products Corp. 190
Houston Technical Laboratories, A Subsidiary of Texas Instruments Incorporated 54
Huey & Co., S. E. 157
Hughes Tool Co. 107, 108
Ingersoll-Rand 34
International Nickel Company, Inc., The 82
Iverson Supply Company 175
Johns-Manville Corporation 64
Jones & Laughlin Steel Corporation 53
Jones & Laughlin Supply Division 63
Kaiser Steel Corporation 27
Kobe 77
Lane-Wells Company Inside Front Cover
Layne & Bowler, Inc. 59
Link-Belt Company 7
L-O-F Glass Fibers Company 30
Macco Oil Tool Co. 176
Mack Trucks, Inc. 14
Marathon Corporation 76
Mark & Company, Clayton 212
Mayo Hotel, The 152
Mercoid Corp., The 206
Miller Sand Pump Co. 152
Mission Mfg. Company 174
National Supply Co., The 177, 178, 179, 180
Nelson Electric Mfg. Co. 157
Oak-San Industries 190
Oil and Gas Journal, The 49
Oil Equipment Mfg. Co., Incorporated 156
Oil Well Supply Division 6
Olin Mathieson Chemical Corporation, Industrial Chemicals Division 35
Oliver Corporation, The 9
Orbit Valve Company 137
Paris Distributor, Inc., Henry H. 200
Parkersburg Rig & Reel Co. 8
Peerless Pump Division of Food Machinery & Chemical Corporation 11
Peerless Supply Co. Inc. 152
Petroleum Electric Power Assn. 36
Philco Corporation, Government and Industrial Division 20, 21
Phoenix Manufacturing Company 46
Pipeline Anode Corporation 160
Pittsburgh Coke & Chemical Co. 33
Pittsburgh Plate Glass Company 67
Polyken Sales Division of The Kendall Company 61
Refinery Supply Co., The 156
Republic Steel Corporation 12, 13
Rockwell Manufacturing Company 73, 74
Rockwood Sprinkler Company 57
Roebling's Sons Company, John A. 32
Roper Corporation, Geo. D. 209
Smith Company, Tyson 69
Smith Corporation, A. O. All Petroleum Products 70, 71
Solar Aircraft Company 60
South Texas College Book Store 152
Southern California Oil Tool Company 152
Southern Mill & Mfg. Co. 208
Southwestern Industrial Electronics Co. 144
Spang & Co. 204
Standard Oil Company (New Jersey) 52
Tapecoat Company, The 155
Taylor Forge & Pipe Works 40, 41
Texas Company, The 65
Texsteam Corporation 176
Thomas Flexible Coupling Co. 207
Thornhill-Craver Co. 42
Trefolite Company A Division of Petrolite Corporation 47
Tube Turns, Inc. 37, 38
Tulsa Winch Division of Vickers Incorporated 202
United States Steel Corporation—Oil Well Supply Division 6
United States Treasury Dept. 18
Universal Oil Products Co. 24, 25
Visco Products Co., Inc. 125
Vogt Machine Co., Henry 44
Wall Colmonoy Corporation 173
Warner Lewis Company 128
Well Equipment Mfg. Corp. 181
Williams Brothers 158
Williamson, Inc., T. D. 170
Worthington Corporation 48, 161
Zink Company, John 75

LEGAL

NOTICE—Sale of oil and gas mining leases, tribal and allotted Indian lands. Department of the Interior, Bureau of Indian Affairs, Navajo Indian Agency, Window Rock, Arizona. Sealed bids will be received until 2:00 P. M. Mountain Standard Time and opened at that time in the office of the Navajo Indian Agency, Window Rock, Arizona, on the following tracts of Navajo tribal and allotted lands on the dates indicated as follows: Group 3: Bids to be Opened: 11-1-56; Tracts Nos. 100, 101, 109, 112, 113, 115, 120, 122 and 122 to 180 inclusive, totaling approximately 123,612.57 acres. Group 2: Bids to be Opened: 11-13-56; Tracts Nos. 53, 54, 55, 56, 57, 58, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 83, 84, 93, 94, 95, 96, 97, 98 and 99, totaling approximately 82,200 acres. Group 1: Bids to be Opened: 11-23-56; Tracts Nos. 1, 2, 4, 5, 7, 9, 13A, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 52A, 52B, and 53A to 72A inclusive, totaling approximately 158,505.40 acres. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the General Superintendent of the Navajo Indian Agency, Attention: Branch of Realty, Window Rock, Arizona



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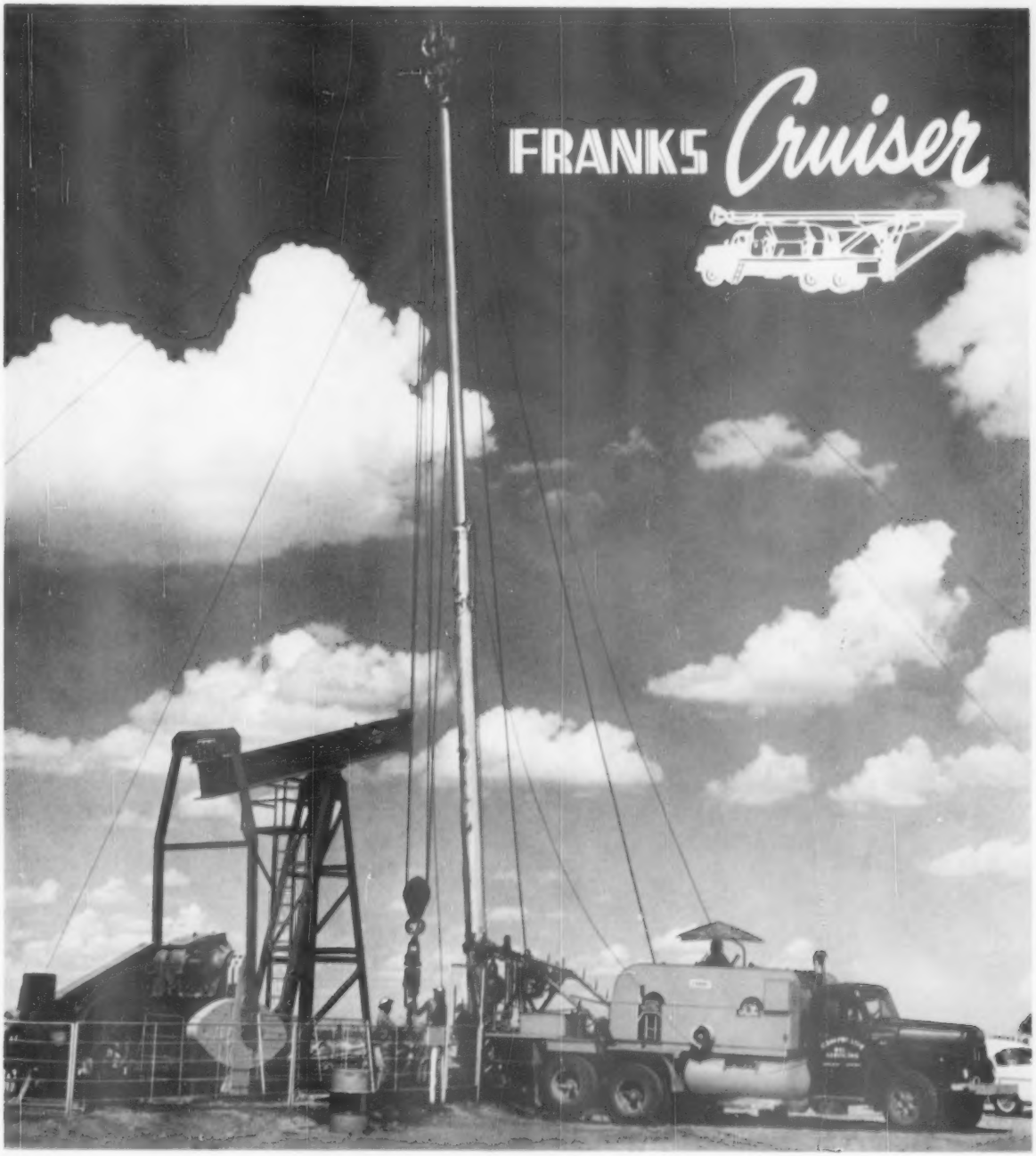

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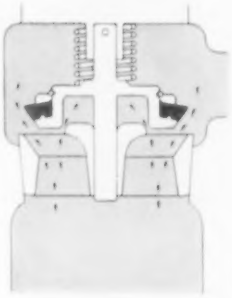
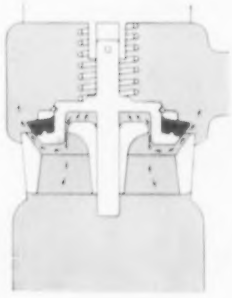
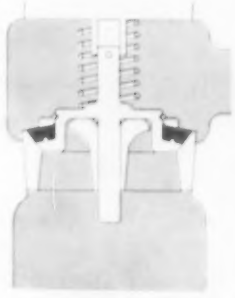


1 Above diagram shows the valve in fully opened position . . . mud has filled the chamber and also the cylindrical area of the valve.



2 As the valve starts to close . . . mud, which is trapped in the cylindrical area of the valve, is squeezed out around the restricted area between the mushroom and the valve.



3 As the valve nears fully-seated position . . . rubber insert contacts seat first and, as mud is entirely squeezed from between the valve and mushroom on the seat, shock is cushioned and the valve fully seats, with no excessive pounding.